Tuesday, 12 June 2012

(10.00 am)

(Delay in proceedings)

(10.10 am)

THE CHAIRMAN: Good morning.

MS ANYADIKE-DANES: Good morning, everybody. I wonder if I might call Dr Mirakhur, please.

DR MEENAKSHI MIRAKHUR (called)

Questions from MS ANYADIKE-DANES

MS ANYADIKE-DANES: Good morning, Dr Mirakhur. Do you have a copy of your curriculum vitae there?

A. Yes.

Q. Do you have a copy of the witness statement you made for the inquiry?

A. Yes, I have.

Q. Thank you. Just for the record, it's witness statement 223/1. If you're looking at that now, can you confirm that's your witness statement?

A. Yes. That it is, yes.

Q. We can go to the signature, but you have a hard copy in front of you there, I see. Do you adopt that as your evidence subject to anything you might say now in this oral hearing?

A. Yes.

Q. Thank you very much. If we go to your curriculum vitae,

that's to be found at reference 306-066-001. I think your initial training was in India; is that right?

A. That's correct.

Q. While you were there, you went through a variety of specialisms: obs and gynae, anaesthesia and then pathology before you came to Northern Ireland.

A. That's correct.

Q. Is that a normal rotation --

A. That is a normal -- yes. When you are in a junior position, you rotate to various disciplines before you choose your own specialty.

Q. Thank you. Then when you came to Northern Ireland, you came to the Royal Victoria Hospital as a senior house officer in pathology.

A. That's correct.

Q. And subject to any appointments you might have had, professional appointments on committees and so forth, in terms of hospitals, have you remained within the Royal Group of Hospitals?

A. Yes, I have.

Q. Thank you. And then you were first appointed to consultancy in an acting position in neuropathology and histopathology in September 1985; is that correct?

A. That's correct.

Q. I think that is up until January 1988. What happened

after January 1988?

A. I was appointed as a consultant neuropathologist in the Royal Hospitals.

Q. I see. Sorry, I see that. Up until you retired in December 2010?

A. That's correct.

Q. If we look at that, the top of the page, 002, right at the top there, you say that you were head of the regional neuropathology service linked laboratories in the Royal Group of Hospitals. What does that mean exactly and what does that entail?

A. Regional neuropathology service is a tertiary referral centre, which is always in the Royal Hospitals because of the neurosciences all clustered together: neurosurgery, neurology. And neuropathology is a sister service to neurology and neurosurgery, which directly relates with them. So therefore all these services are regional and they were all centred in the Royal Hospitals. So I became head of regional neuropathology service on the retirement of my predecessors in 1997.

Q. Does that mean that the Royal provides a service for the whole of Northern Ireland in terms --

A. That's correct.

Q. -- of regional neuro services?

A. That's correct.

Q. Thank you. In your experience, you say that you provide service to the regional neuropathology department and take part in external and internal quality control schemes. Do you have any contact at all with the department now or the service now?

A. Not since I retired.

Q. Are you carrying on as a pathologist since your retirement?

A. No, I'm not.

Q. Thank you. If we might turn to your witness statement, that's at 223/1. We can see your membership of advisory panels and committees and your previous appointments. Can I ask you: did you have any contact at all with the State Pathologist's department?

A. The State Pathologist's department always provided us with cases from time to time in which they thought that the specialist neuropathology input was required. But I was -- I never worked in their department. I never had any direct liaison with them.

Q. I understand. So if you were doing any work for them, it would be on a referral?

A. That's correct.

Q. So if I'm right, could I categorise it in this way, there would be a specific neurological aspect of it that they wanted some expert opinion and you'd be brought in

to do that?

A. That's correct.

Q. When that happened, how would it happen, what was the way? I should be specific. I mean: in 1995, how would that have happened?

A. In 1995, the referral system was not as formal as -- well, first of all, I think I'm not clear as to what is an informal referral because referrals are always formal. You may express an informal opinion or an informal view, but the referrals are always formal when you are involved in the case from the very beginning and you are involved in the workup of the case and you provide a formal report. In 1995, sometimes the forensic pathologists, they will do everything by themselves, and they might occasionally show you something, you know, what is your opinion on this. Pathologists quite often do that. It's not unusual for a pathologist to show each other things for an informal opinion. But I would not regard that as a referral. That would be an informal view.

Q. So if there's a referral, you are taking responsibility for the opinion you're providing?

A. That's correct, which means that in cases of autopsy cases, you're involved in a formal referral from the very word go, right from start, which is in the

mortuary. You're asked to actually give your input and then the case is referred to you on written paper or in a very formal way and a covering letter comes with it and then the case comes over to your department and everything -- processing and the rest of the workup of the case -- is done in your own department. Then you provide a report.

Q. If that happens, would your department assign it its own reference number?

A. That's correct.

Q. And how might that happen? Do you get a letter from the particular pathologist? Could it happen that the coroner would want you to be involved?

A. It can work both ways, but it is usually the pathologist who's involved in the case or sometimes the coroner when the -- he looks at the case and he thinks that there might be a requirement here for a specialist neuropathologist to be involved. They might suggest that to the original pathologist that they would wish a neuropathology opinion. But usually it is from the referring pathologist and they would ask your opinion, either in the mortuary or they will refer -- they have done the case themselves. For instance, if it is in a remote mortuary outside the Belfast area, they have done the case, take your opinion, discuss with you on

the telephone and then provide you with a letter and the case comes over to your department then.

Q. In terms of how that might happen, I suppose there might be cases where, at the very outset, the pathologist could see that this is a case where we're definitely going to need a neuropathologist.

A. That's correct.

Q. That might be one way. And another way might be that as the pathologist starts to do the autopsy, it becomes clear that this would be prudent to involve a neuropathologist; is that possible?

A. That's correct.

Q. If it happens at the very outset, what is the procedure? So far as you can recall from 1995 -- and I accept it wasn't as formal then, but if you can help us with what the typical procedure would be, if it happens right at the outset.

MR FORTUNE: Sir, could we just establish -- and it may be it's a shortage of knowledge on my part -- is the neuropathology department and the state pathology department in the same building? How close are they? Is it a case of nipping next door for an opinion?

MS ANYADIKE-DANES: It's a very good question. I was going to come to that.

You're on the Royal site?

A. I'm on the Royal site.
Q. Where is the building or the offices of the State Department?
A. The State Department is on the Royal site as well, but it is a totally separate building and it is actually -- if you go towards the Royal car parks then the State Pathology department is right in front of the car parks. We are in the Institute of Pathology, which is a separate building.
Q. We've actually got a map and we'll try and pull it up and see if we can assist by identifying where these places are.
THE CHAIRMAN: Am I right in thinking you're just a few hundred yards apart?
A. Yes, but it's a totally different building.
MS ANYADIKE-DANES: And in terms of the mortuary that the State Pathologist would be using, do they have their own mortuary on the site --
A. Yes, they have.
Q. -- or do they use the hospital's mortuary?
A. They have their own mortuary.
Q. And so far as you are aware, you have talked about going off-site to maybe other mortuaries, do they have other mortuaries as well?
A. Yes.

Q. Do you know which was the mortuary that was most frequently used, roughly, at the time that we're talking about, which is the mid-1990s?
A. In 1995, it was the Royal Hospitals' mortuary which was most frequently used.
THE CHAIRMAN: I'm not sure I understand that. Most frequently used for what?
MS ANYADIKE-DANES: For the --
A. For autopsies --
Q. For autopsies being carried out by the state pathologist, sorry.
THE CHAIRMAN: In 1995, the State Pathologist had its own mortuary and the Royal had its mortuary?
A. Not in 1995. In 1995, there was one mortuary, which the State Pathologist used as well.
THE CHAIRMAN: You have described two separate buildings.
A. Yes.
THE CHAIRMAN: One for the State Pathologist and one for the neuropathology department. Where was the mortuary in 1995?
A. The new mortuary came actually after 1995, but in 1995 there was a mortuary which was actually behind the Institute of Pathology and sometimes the State Pathologists would actually use that mortuary.
THE CHAIRMAN: If the State Pathologist did not use that

mortuary, then he had nowhere else on the Royal site?
A. At that time. Not in 1995 ...
MS ANYADIKE-DANES: Can we maybe call up 300-003-003? If you look at this map, if you orientate yourself, the mortuary and state mortuary are to the far right, bottom right. There we are (indicating). You can see "medical records" and "laboratories". In 1995, where was the State Pathologist building, if I can put it that way?
A. I am trying to locate where is the Institute of Pathology.
THE CHAIRMAN: Just take your time. It might take a moment or two. The Falls Road is running along the top and the West Link is running along the bottom.
A. Yes. It doesn't actually say where the Institute of Pathology and laboratories are.
MS ANYADIKE-DANES: It says "mortuary and state mortuary". You can see that highlighted in yellow.
A. Yes. That was in 1995, was it?
THE CHAIRMAN: This map is described to us as being about 1993.
A. So the same was in 1995, yes. The laboratories are actually just in front of the mortuary and the state mortuary and the mortuary and the state mortuary is actually behind the laboratories according to the map there. So that's what I pointed out, that the -- in

1995, the mortuary and the state mortuary was behind the Institute of Pathology, which is the laboratories.

MS ANYADIKE-DANES: So the building where you would be typically working is the one that's labelled "laboratories"?

A. That's correct.

Q. And the building where the State Pathologist would be typically working is round where the mortuary is; is that right?

A. That's correct.

Q. And in 1995, just so that we're clear about it, there was actually only one mortuary to use and both you as a pathologist and the State Pathologist would be using that single mortuary; is that right?

A. As far as I can recall. I'm not sure what is the exact date when the new State Pathology -- they moved into their own building. I'm not sure of the date.

THE CHAIRMAN: Sorry, doctor, this may not be ultimately very important, but the building which is marked "mortuary and state mortuary", are you saying that that is where the State Pathologist's office was?

A. No. That's where the mortuary was, not their offices.

THE CHAIRMAN: So the mortuary was very close to the Institute of Pathology which, in this map, is marked laboratories?

A. Yes, that's the building where the Institute of Pathology is, which is the laboratories, marked as "laboratories", and the mortuary and the state mortuary were actually just behind that building.

THE CHAIRMAN: Well, compared to them, can you identify roughly where the State Pathologist's office was?

A. The State Pathologist's office used to be on the ground floor of the Institute of Pathology and the pathology department and the neuropathology was in the basement and on the second floor of the same building.

MS ANYADIKE-DANES: So in 1995 you were all in the same building?

A. I think so, but I'm not sure about the dates when they actually -- this new state mortuary came about.

Q. Okay. I think I had asked you in 1995, where, so far as you can recall -- and it may be that you can't -- where the majority of the autopsies being carried out by the State Pathologist, which mortuary that would be in, and I thought you had said that would have been the mortuary on the Royal site?

A. That would be the mortuary on the Royal site, yes.

Q. The one that we've just been looking at? You mean that mortuary that is just highlighted in yellow?

A. Yes, but I'm saying that the new hospital mortuary also came about around or just after that, so I'm not exactly

sure of the dates.

Q. We have Dr Armour coming so we'll ask her.

THE CHAIRMAN: I'm not sure that this map has really helped to clarify the position at all, in fact.

MS ANYADIKE-DANES: I don't think it has.

THE CHAIRMAN: Can we move forward on the basis, doctor, that in 1995, to your recollection, there was a few hundred yards from the offices where you worked and the offices where the State Pathologist worked?

A. That's correct.

THE CHAIRMAN: And there was, at that time, a single mortuary which was adjacent to your office?

A. The mortuary was not actually adjacent to my office; it was behind the building where my office was.

THE CHAIRMAN: Okay.

MS ANYADIKE-DANES: So what you were helping us with is if a situation had arisen right at the outset in an autopsy where the State Pathologist realised that the input of a neuropathologist would be required, what actually would happen in 1995.

A. Well, they will either consult us on the telephone and say, "We've got this case in which we think your input is essential", and then it actually depended upon the State Pathologist or whosoever was doing the -- starting the initial case. They would either request

a neuropathologist to come down or they will do the autopsy themselves and then let us have our opinion later on.

Q. Well, if you receive a request like that, saying that they think that the input of a neuropathologist is essential, how early do you want to be involved or what do you want to see and do if you're going to end up providing the opinion?

A. As far as I'm concerned, it varies between pathologists, but if my opinion is required I would like to be involved from the very beginning and I would like to be present in the mortuary and involved in the case myself. Hands on work rather than depending on somebody else's --

Q. I understand. Would that extend to seeing when the brain is taken out?

A. It's not only seeing when the brain is taken out, but removing the brain myself.

Q. You would actually want to do that?

A. Yes, because we would have -- that's why the specialist's opinion is required because we would dissect it and anatomically orientate the case and do it in a way in which a specialist neuropathologist would do it.

Q. Would you then decide where the slides were going to be

taken from and take those slides?
A. Yes, yes.
Q. And then you would go and examine those in your laboratory, microscopically?
A. Yes. It's not only the slides which -- or the tissue samples which would be taken, but the tissue samples and the case will come to our laboratory because the brain is ... I think it is very important to understand from the outset that the brain is a very complex organ. It is very different from the other organs and requires very specialist input from the very beginning. So our laboratory technicians are trained differently than the general laboratory technicians or even the state mortuary technicians because they are trained to deal with a very complex and a very delicate organ like the brain. So the processing schedules and workup of the brain tissue samples is very different say from liver, kidney, spleen or whatever.
Q. I understand. So if you are then going to the mortuary to view the brain, take the brain out and however much of the spinal column you wanted to take out, so take charge of the case, of all the brain element of that autopsy; would that be a fair way of saying it?
A. That's correct.
Q. Does your technician take the photographs if you were

doing that?

A. Well, if we are doing it, it depends on at what stage you want the case to be photographed. If while we are in the process of dissecting the brain or removing the brain and you feel that there is a need for taking photographs while the brain is in situ to demonstrate the anatomical connections and the anatomy of the lesions which may be present, you take the photograph there yourself in the mortuary, but if at a later stage when the case has been processed in your own laboratory and you feel at a later stage, yes, there is a need for the case -- for further photographs to be taken, then our technicians along with us ... But the pathologist will always be there when the photographs are taken to orientate and tell them which bit of the brain we would wish to be photographed.

Q. So the situation that you have just been describing is when you're brought in right at the outset or you're notified right at the outset and this would be your preferred practice, in other words, to take control over the whole brain element of it --

A. That's correct.

Q. -- and deal with the fixing of the brain and everything that happens thereafter?

A. That's correct.

Q. And so all those initial notes when the brain is first exposed, if you want to be there, all those notes -- you would be making your own notes in relation to that?
A. That's correct.
Q. And ultimately, when you produce your opinion, do you produce something that looks very much like a report on autopsy just confined to the brain or do you produce an opinion in a slightly different way?
A. Well, what happens is that we produce our opinion, which is confined to the brain. Now, it may well be that in some cases -- well, in most cases where a neuropathology opinion is sought, that is the major issue because otherwise they wouldn't seek neuropathology opinion and, in most cases or in the majority of those cases, the cause of death would be there. So you provide your opinion on the basis of what you actually come across or you see in the brain and your formal report is based on that. But the report will then go to the original referring pathologist and they would then take that into context of what the findings were.
Q. So then let's move to the other scenario that I put to you, which is, for various reasons, you're not brought in right at the outset. Maybe it's not appreciated, the significance of having a neuropathologist then, but at some stage it is appreciated that that would be helpful.

What happens then? So how is your opinion sought in those circumstances?

A. Well, in those circumstances -- for instance, they have done the autopsy, they have got the brain out ... And I think one of the things which is very peculiar to the brain is, many times, there may not be anything external to see on the brain. And also you cannot give an opinion on the brain on the day or at the time you're doing an autopsy. It's only after the brain has been allowed a period of fixation so that it can assemble and become firm. You then do a further detailed dissection.

So at that point, the original pathologist might decide when they cut the brain or with when they dissect the brain that, oh, this may require a neuropathology opinion. So they can refer the case at different stages as they workup the case, either from the very beginning or at different stages of the case.

Q. If you get at any of those subsequent stages -- so it's not you who viewed the brain, who took the brain out, who fixed it and who took the slides and decided where those slides should be taken, all that sort of thing, that's not you -- you get a referral when all that work has been done --

A. Yes.

Q. -- because somebody appreciates that this might be

relevant. What do you want to see if you're just contacted?

A. Well, first of all, we always say that in the form, if we are asked to provide a report on, say, at a later stage in the processing of the brain, we would always make it clear on the report what stage of the processing the case we were asked --

THE CHAIRMAN: But doctor, that would only be if you did a report.

A. That is only if you did a report, yes.

THE CHAIRMAN: I think in the scenario that we're talking about in Adam's case, it doesn't appear that you did do a report.

A. No.

THE CHAIRMAN: As I understand it, you have no recollection of Adam's case at all.

A. No.

THE CHAIRMAN: So in Adam's case, we're not talking about a situation in which you were involved from the start.

A. Right.

THE CHAIRMAN: We don't even appear to be talking about a case in which you were brought in as the autopsy developed and did a report --

A. That's correct.

THE CHAIRMAN: -- or contributed to a report of any sort.

A. That's correct.
THE CHAIRMAN: So I think what you were really being taken to was: in a scenario where it occurs, say, to Dr Armour "I would like some input from Dr Mirakhur or from somebody else", but that doesn't get to the stage of you preparing a written report --
A. No.
THE CHAIRMAN: -- what might it be that you're shown or told and what might be your response to that?
A. Well, they would probably show glass slides, which are already prepared by them, by their department, and they would say, "Can you have a look at this and what is your view on this? What do you think?", but then the neuropathologists always feel that that is maybe not 100 per cent appropriate way of doing it because you're not being involved from the very beginning and therefore you can only give opinion or a view on a very limited area of the brain.
THE CHAIRMAN: Yes. So if you're not involved from the start, the extent of your input is bound to be limited?
A. Very limited, yes.
THE CHAIRMAN: Okay. And that might be why it doesn't end up being recorded in writing or you don't give any written report yourself because you're only giving a limited input? I think what we're trying to get at

is: what is that limited input which you do give?

MS ANYADIKE-DANES: I wonder if I can come to it this way because there is a specific way in which Dr Mirakhur is referred to in the report on autopsy and which is why I wanted to approach it just slightly differently.

Just to be clear: you are giving us two ways in which there could be an actual referral. The first is you come in right at the beginning; the second is, at some stage subsequent, you still have a referral. It's still a formal process --

A. Yes.

Q. -- and, no matter at what stage, it's still requiring you to produce an opinion. And what I had asked you is: if you came in like that, what would you want to see? Forget the informal bit at the moment; this is you being asked to do an opinion, but at some stage after all that work has been done -- the brain has been fixed, slides have been taken and so forth -- and they realise there's a neurological issue here, we need to get a neuropathologist's input. What do you want to see?

A. Well, that's what I said: that it depends on what stage they have asked you to look at it. If they are, for instance, dissecting the brain, which is at the naked eye stage still, and they are slicing the brain into different sections and they might say, "Oh, we've come

upon something and we need a neuropathology opinion", so they would ask neuropathology to have a look at it, but in that case they only have the macroscopic slices of the brain. Or if they have already done that and when they look at the histology -- and histology means looking at the sections under the microscope -- so if they're looking at the sections under the microscope and they come across something which they think that it requires a neuropathology input, they would then ask you to look at the histology slides. But in a referral like that, the neuropathologist would always ask them: do you still have the brain with you or the coronal slices with you? Because neuropathologists always like to have a look at the naked eye exam of the brain itself to work out the topography of the lesion. What they're seeing in the histology, what is it in a broader sense, what does it imply in terms of the brain itself.

Q. I understand that. So even if you were brought in at a relatively late stage, if you were being asked to provide your opinion -- so it's coming from state pathologist department to your department, so it's going to be formal, you're going to give it a reference number -- you would be indicating to the State Pathologist over and above whatever they wanted to show you what you wanted to see?

A. That's correct. That's correct.
Q. If we then go to the report on autopsy at 011-010-040. You can see just above "commentary", there's:
"The brain, spinal cord and histological slides were seen by Dr Mirakhur (consultant neuropathologist)."
A. Mm-hm.
Q. Now, if you can't say, you can't say --
A. I have seen it.
Q. Sorry, do you see it there? Does that indicate to you what you're being asked to do in relation to that?
A. Well, I don't actually recall all that.
Q. No, I know you don't. But if you look at that reference to you there, what -- if anything -- does that suggest to you?
A. Well, that suggests that they might have requested you to look at the slides at some stage, not without -- without being formally referring the case.
Q. And the brain and the spinal cord?
A. Um ... Yes, but I don't recall seeing the brain, spinal cord.
Q. I appreciate you don't recall that. But if you were being asked to look at that to give -- in fact, Dr Armour refers to it as a second opinion in your witness statement. So if you were being asked to give a second opinion and you're shown the brain, spinal cord

and histological slides, what else would you be told? Would you be being told what the pathologist's opinion was and why they wanted a second opinion or would just be told, "Have a look at this and tell me what you think", or can't you tell?

A. I don't think you can tell.

Q. Okay. If you were asked to give a second opinion and given that range of material that you've been provided with, what else would you want to see?

A. Well, you would want to know what else was in the rest of the organs and what was the clinical scenario and what was the clinical context in which you have been asked for an opinion.

Q. So even if somebody came, walked across a few hundred yards to your office and said, "Look, forget about the fact that this refers to the brain and spinal cord and had some slides" -- which I think you said that was common, that could happen -- and showed you the slides and ask you to provide a second opinion in relation to what they disclosed to you, what else would you want to see?

A. You would tell them before you look at the histology and give an opinion on the histology slides that you would like to have a look at the brain if it is still there because you would need to put what you're looking at

under the microscope in context of your naked-eye examination of the brain. But I don't recall seeing any of it.

Q. No, I understand very much that you don't recall that.

THE CHAIRMAN: Doctor, you don't recall it and you're being asked to comment on what Dr Armour has written. We acknowledge these are not your words when she says that the brain and spinal cord, et cetera, were seen by you. That is what she is saying. She is also saying that you gave a second opinion, but as I understand from what you were saying earlier, that opinion -- there could be a whole range in which that opinion falls, whether it's an informal -- well, this seems to be informal rather than formal because there's nothing in writing from you; right?

A. Yes.

THE CHAIRMAN: And in terms of informality, is there a range of ways in which you could give an opinion or a view or a steer, even, to Dr Armour?

A. Well, in this particular case, I don't recall giving an opinion. But it might take the form of just verbally telling them what you think of it when you're looking at the histology.

THE CHAIRMAN: Or might she say to you, "This is what I think; does that look right to you?"

A. I think she may say that, but at the end of the day, if a neuropathologist is asked to look at the slides, they would wish to give their own opinion.

THE CHAIRMAN: Okay.

MS ANYADIKE-DANES: If you knew that your name was going to be included in a report on an autopsy going to the coroner, what would you want to see in order to be satisfied that your name could be included like that?

A. Well, I would have wanted a formal referral and I would not be satisfied with just informally asking for an opinion because that way you have not been involved from the -- in the case from the very beginning.

THE CHAIRMAN: Even in 1995?

A. Even in 1995.

MS ANYADIKE-DANES: Are you ever aware of your name having been included in a report on an autopsy going to the coroner where you haven't known that that was going to happen?

A. I don't recall it because --

THE CHAIRMAN: How could she?

MS ANYADIKE-DANES: Because it might have disclosed itself later on in the inquest.

THE CHAIRMAN: But if she wasn't involved, it would be something of a long shot for you to find out subsequently, wouldn't it?

A. The only reason I found out about this one was when the report was sent to me by the department, that this is coming up for an inquiry, and then I looked at the report, I saw that line, but other than that, that was the first time I had actually seen the report even, so I didn't even know that my name was actually mentioned there. I was not aware of it.

MS ANYADIKE-DANES: So far as you are aware, have you ever been named in a report after simply giving an informal opinion?

MR BOYLE: That's the same question.

MS ANYADIKE-DANES: No, it's not the same question because you could have been shown the report after having given an informal opinion.

THE CHAIRMAN: I will take it subject to my and your intervention originally, Mr Boyle.

A. I don't know.

MS ANYADIKE-DANES: So far as you're aware, have you ever been named in a report when you have been asked simply to give an informal opinion?

A. I don't recall that.

Q. Thank you. You've now seen this report on autopsy, obviously.

A. Yes.

Q. So you see how the findings are described and what the

pathologist concluded as the cause of death. In your view, is that a case in which it was quite proper to involve a neuropathologist?

A. Well, I think I ... I'm not here as an expert witness.

Q. No.

A. So I cannot answer that question. I'm only here in my professional status. So it is actually up to the referring pathologist whether they wish to involve the neuropathologist or not.

Q. I understand that.

A. And one of the difficulties with such type of cases is when there may not be any macroscopic lesions in the brain, it is difficult for them to actually know whether -- what they're going to find subsequently in the brain or not, either at sectioning it or on the histology.

Q. Let me put it maybe in a slightly different way. Have you ever been involved in providing your opinion in a case of paediatric cerebral oedema?

A. Yes. Those cases sometimes would come to us from the Paediatric Pathology Service, not from the Forensic Service.

Q. And then I wonder if I might ask you a few questions to do with brain weight. In your witness statement at page 4, there's a question 2, which starts a series of

questions to do with brain weight.

A. Mm-hm.

Q. Is this an area that you would have any familiarity with, the weights of paediatric brains?

A. Yes.

Q. If one looks at that brain weight, this is a four-year-old boy, 20 kilos approximately, 1,300 grams. How does that compare with an average brain weight of a child of that age and size?

A. Well, the recorded weight, which is actually in the report here in the statement I'm seeing here, is 1,680.

Q. No, no, I've asked you about the 1,300 grams.

A. 1,300 for a four-year-old, that is within normal limits. The upper limit of the normal, but it is --

Q. It is within normal limits?

A. Because the range is, say, between 1,200 and 1,350. So it is within the upper range of normal limit.

Q. Then if one deals with the -- the 1,320, I think, was the unfixed brain weight of Adam.

MR BOYLE: Sir, I think we may be using Dr Mirakhur as an expert. Two experts, I think, are going to comment on brain weights and there has been an acceptance on Dr Armour's behalf in relation to the fresh brain weight -- and Dr Squier, in fact, agrees with this -- is not likely to have been the 1,320 that is recorded

in the report. It is likely to have been more than that, ie closer to the fixed brain weight. I'm just concerned that we're using this witness, who I understood was going to be a witness of fact, to give expert evidence about brain weights when you're going to hear from two actual experts on the topic.

MS ANYADIKE-DANES: I understand that. The only reason for asking her about it is because she has actually addressed it in her witness statement.

I take the point, but I should correct one thing. Dr Squier is going to give her evidence that although she has accepted that, she is not in a position to know what was most likely or not likely to be a fresh brain weight at that time as she didn't measure it. But I entirely accept, Mr Chairman, that it may not be appropriate to take this witness through what her thoughts are of the various weights and I simply did it because she had referred to them in her own witness statement.

A. Well, I referred to the weight which is recorded here, 1,680.

Q. Yes, that's the fixed brain weight.

A. Yes.

Q. Obviously, there's an unfixed brain weight, and that is the area I was taking you to before, but I'm happy not

to continue with that. I wonder if you'd just give me a moment, Mr Chairman.

Mr Chairman, I don't have at the moment further questions. I wonder if you might allow me a few minutes just to canvass my learned friends.

THE CHAIRMAN: I just want to pick up one point: you were being asked about different forms of referral, doctor, but, as I understand it, in 1995, there was no formal referral system.

A. No.

THE CHAIRMAN: So things were looser then, less structured than they gradually became over the following years?

A. I think it's very difficult to go or we keep going back in retrospect because although there wasn't a formal referral system, but still in 1995 there were cases which the pathologists would, from the outset, think this requires a neuropathology opinion. It didn't happen on a regular basis, but it still did happen that the pathologist, if they think that a neuropathology input was required, they would formally refer. So it's not that it didn't exist or it was looser, but it wasn't used as regularly as it is now.

THE CHAIRMAN: I think you also said the way in which your office would be approached depended on who the pathologist was because some pathologists had -- each

pathologist had a slightly different way --

A. Different ways of doing things. That's correct.

THE CHAIRMAN: Okay. Are there any questions that --

MS ANYADIKE-DANES: There might be. That's why I wanted to see if I could take a sounding.

THE CHAIRMAN: I will rise for five minutes.

(10.51 am)

(A short break)

(11.03 am)

MS ANYADIKE-DANES: I just have a few questions, Mr Chairman.

In 1995, if a pathologist anywhere -- whether or not in the State Department -- wanted to seek expert input from a neuropathologist, who else other than you could they go to?

A. At that time there was my colleague, who retired in 1997, Professor Allen.

Q. But in 1997?

A. She retired in 1997. So she was still there in 1995.

Q. Okay. Is that it?

A. That's it. And then there was a registrar, senior registrar. But they usually -- whenever a formal referral was requested, it was usually to the consultant neuropathologist.

Q. So there'll be just one other consultant that they would

go to?
A. Yes.
Q. And that would be so for the whole of Northern Ireland?
A. Yes.
Q. Had you worked with Dr Armour before? Worked in the sense of having been brought in by her into a case?
A. No. I don't recall that.
Q. When did you first learn that Adam Strain had died?
A. That was on the -- it's in my statement. That was on 28 October, I think, when I received a copy of the report from the department that the inquiry has requested my statement. So I actually learned through the report. But I hadn't known before that. I was not aware of the case at all.
Q. Yes, maybe that's the way I wanted to put it to you. You could have known about it, but you don't remember knowing about it?
A. I don't remember.
Q. Or do you know for a fact that you didn't know about it?
A. That's correct. I don't remember about it.
Q. So you could have heard about it?
A. I don't recall it.
Q. I understand. As at 1995, were there facilities for neuroimaging MRI scans, so far as you recall?
A. I think there definitely was facilities for CT scanning,

but I can't recall whether there was for MRI. I think MRI maybe came later on. But I don't remember the exact dates when they came.

Q. Is it possible to do an MRI scan when the person's dead?

A. Yes, it is possible to do an MRI scan when a person is dead, yes.

Q. Can it be useful of the brain?

A. Yes, it can be useful. In fact, more recently, when the techniques have become much more sophisticated and a much better correlation is sought between the clinical imaging and pathology, it gives a very good relationship between the topography of the lesion and the distribution of the lesion. Yes, so in some cases it could be quite helpful.

Q. If it's available and there are issues to do with, for example, cerebral oedema, is it a good thing to do?

A. Yes, it is. Well, it will show the swelling of the brain.

Q. And if it were available, would there be any reason not to do it?

A. Well, I think it's very difficult to have full use or a regular -- can I put it this way -- regular use of MRI in autopsy because MRI is a very expensive technique and there's a lot of requirement on it, on doing imaging on the patients who are living and they are undergoing

biopsies as part of neurosurgical practice. So on autopsies, it's actually very difficult from the timing point of view, whether it would be available and how frequently it would be available. There usually is a list, waiting list, for the MRI, even for the living patients. Unless there is a dedicated service, which is different from the living.

Q. I understand. When you said from the timing point of view, what did you mean by that? Is it something that has to be done within a certain period if it's going to be useful?

A. It should be done -- well, it is usually done as soon as possible after death, if an MRI is required of the brain.

THE CHAIRMAN: Sorry, does that mean that you'd have to have a particularly strong reason for asking for an MRI scan of a dead child?

A. That's correct. Very strong reasons. That's correct.

THE CHAIRMAN: And if we wanted to trace when MRI scanning became available, how would we do that?

A. How do you mean?

THE CHAIRMAN: You're not sure whether there was a facility in 1995 for MRI scanning, but you think that there may not have been?

A. There may not have been, yes.

THE CHAIRMAN: How could we find that out? Would there be records about when the MRI scanning became --

A. I'm sure the radiology department may have records, but I'm not sure.

THE CHAIRMAN: I know you don't have them; I'm just wondering who we should ask for them.

A. Maybe the radiology department.

THE CHAIRMAN: Thank you.

MS ANYADIKE-DANES: Forgive me if this completely betrays my ignorance of the equipment, but can you do a CT scan of a person who's dead?

A. Yes, you can do a CT scan of the brain. Yes, you can do a CT scan.

Q. So if you don't have MRI imaging available to you, can a CT scan be helpful?

A. It depends on what you're actually looking for. In cases of maybe cerebral oedema, MRI's probably more useful than the CT would be useful. CT would be more useful if there is, clinically and radiologically, a specific lesion in the brain. Cerebral oedema is a lot more generalised and so I'm not sure how useful a CT would be. But it can actually show swelling or maybe, you know, the affects of the swelling of the brain.

Q. Forgive me if this is not your area and you don't feel comfortable answering it, but on a CT scan, can it show

the distribution of swelling?

A. Well, if the swelling is generalised, it will show that the whole brain is swollen as against one area of the brain.

Q. But it can show that too, can it?

A. Sometimes, not always.

Q. Yes. You were explaining that if you had been contacted formally -- although I know you don't like that expression -- but contacted to give an opinion right at the outset, the first scenario I gave you, you said that you would have wanted to go to the mortuary and you would have wanted to view the brain and take the brain out and take charge of all that follows.

A. Yes.

Q. And I think you were saying that one of the reasons that you wanted to do that is because you want trained people to handle the brain, you want your trained eyes -- you didn't use that expression, but that's what I understand -- to look at it to make the first observations and so forth.

A. That's correct.

Q. So if there is going to be an issue about the involvement of something happening in the brain and the contribution of that to the patient's death, how important is it that somebody with your training and

expertise is looking at it as soon as one can?

A. Well, I think if formal neuropathology opinion is sought, it is always important that the neuropathology involvement is from the very beginning and as soon as possible because then you can -- neuropathologists can assess the case for themselves and also will look at what they want to look at rather than not look at what some other pathologists want to look at. So it's very important, I think, for a neuropathologist to be involved from the very beginning.

Q. Presumably, from your training and expertise, you can identify where you want the slides to be taken once the brain is fixed?

A. Yes.

Q. What happens to the rest of the brain when the slides are taken and the report is prepared?

A. Well, the rest of the brain, when it is coronally sectioned after a period of fixation, it stays in formalin until the histology is completed because occasionally ... What might happen is that when you have actually -- especially in cases where there is no specific lesion to look at on the naked-eye examination and it's only histology which may provide you with the answers. After you have looked at the histology, you maybe should go back to the coronal

slices to look at them again in context of the histology. So the brain actually stays in fixated state until you have completed the entire report.

Q. And then what happens?

A. Then it is usually disposed of.

Q. So if somebody has not appreciated the significance of taking slides from a certain area, it's not possible after the report is done to go --

A. No, it's -- well, I think if they have not appreciated the importance of a neuropathological input in it, they may, after the coronal sectioning, dispose of the brain. So what you're actually limited with then is just the histology. You give your opinion on the histology.

Q. Is that part of the reason why it's important that --

A. That's correct.

Q. -- if what happens in the brain is going to be significant that a neuropathologist is involved as soon as possible?

A. Yes, I think that's what I said in the answer. The neuropathologist would take the sections from what they wish to according to the training which they have rather than going on another pathologist.

Q. Do you sometimes carry out brain-only --

A. Yes, we do --

Q. -- post-mortems.

A. -- in consented post-mortems, yes.
Q. I see. So that would be a hospital post-mortem?
A. Yes.
Q. If that's going to happen, is it a neuropathologist who is involved in doing it?
A. That is a neuropathologist's involvement, yes.
Q. Excuse me just a minute. Can you help with one final question? When would you only do that?
A. Only in consented autopsies when the families have given only consent. Well, when the clinicians think that the major cause of death is in the brain and the families have also given consent only for the brain to be looked at and they don't want the rest of the body to be disturbed.
MS ANYADIKE-DANES: Thank you. Mr Chairman, I don't have anything further.
THE CHAIRMAN: Okay. Any more questions? Mr Boyle?

Questions from MR BOYLE

MR BOYLE: Just arising from the question you asked in terms of cerebral oedema. It may be difficult for you to answer this, but would all deaths where there has been cerebral oedema have been referred to a neuropathologist in 1995?
A. Not necessarily, no.
Q. And is cerebral oedema something which is in fact

capable of being diagnosed on a macroscopic basis in the first instance?

A. Yes, on the -- well, a trained neuropathologist can diagnose cerebral oedema on a naked-eye examination.

Q. You would agree presumably that even a pathologist who is not an neuropathologist would be capable of determining whether there was cerebral oedema present on a macroscopic basis.

A. Yes, well, it depends upon the degree and whether cerebral oedema was, in the first place, instrumental in the cause of death. Because there will be not only cerebral oedema present, but there will be the effects of cerebral oedema, like herniations and conings, so a pathologist who's not completely trained as a neuropathologist, if it is very obvious, they can recognise that.

MR BOYLE: Thank you very much.

THE CHAIRMAN: Thank you. Thank you very much, doctor, for your time.

(The witness withdrew)

MS ANYADIKE-DANES: Could I call Dr Squier?

THE CHAIRMAN: Yes, please.

DR WANEY SQUIER (called)

Questions from MS ANYADIKE-DANES

MS ANYADIKE-DANES: Good morning, Dr Squier. Do you have

your CV there?

A. I do, yes.

Q. That's to be found at reference 306-070-001. There we are. You have been a consultant neuropathologist since 1984, but -- I beg your pardon, before I do that, I should do something formally.

Do you have your reports there? You've provided three reports to the inquiry: your first report of 15 October of last year, an addendum report of 28 January of this year and a supplemental report of 17 February also of this year.

A. Yes, I have my own copies here.

Q. Do you adopt those reports as your evidence, subject to anything that you may say in this oral hearing?

A. Yes, I do.

Q. Your third report, the 17 February report, is a report that deals in large part with the report of Professor Kirkham, following two expert meetings in Newcastle, one in February and one in March; that's correct, isn't it?

A. Yes, that's right.

Q. We're not going to address those issues during this hearing, so we're going to concentrate on your first two reports and your observations of the material that's provided to you in relation to the report on autopsy and

the report itself.

So if we go back to your curriculum vitae, I had asked you and you had said confirmed that you were a consultant neuropathologist since 1994 and that you were trained in Great Ormond Street. Since that and since you became a consultant, have you always been in the Oxford hospital, the John Radcliffe?

A. Yes, I have.

Q. And can I ask you, before you specialised as an neuropathologist, did you act as a pathologist, carrying out more general autopsy work?

A. Yes, I did. I began my career after my training in paediatrics, did a couple of years in paediatrics, and then I went into general pathology and, in fact, took my membership of the Royal College of Pathologists in general pathology and then specialised in neuropathology.

Q. Then if we look at your first page, when you talk about some of your publications, you talk about the research into the nature and timing of brain damage, and you also refer to your publications in peer-reviewed journals and editing a book on the timing and causation of developmental brain damage. I wonder if I can take you, though, to page 003, where you talk about your current research.

If one looks immediately underneath that title, "current research", you say:

"I am currently involved in research studying age-related structure and physiology of the dura, looking in particular at fluid transport through the dura at different ages and how this may affect the vulnerability to dural bleeding in the infant."

For the layperson, what does that mean and does it have relevance to the sort of issues that we're dealing with in Adam in terms of the development of cerebral oedema?

A. No, I don't think it does. This is really applied to much younger babies, who are very different before the first year of life. It's looking at a structure called the dura, which is the fibrous membrane that surrounds the brain and lines the skull. It is important in that it carries all the blood leaving the brain back to the veins of the neck through some channels called dural sinuses, which may have a little relevance, but essentially this research is to look at the finer structure of the dura and its function in infants under one year of age.

Q. If we go on to the second paragraph where you talk about your current research and you talk about the water handling by the infant brain and pathways of fluid

re-absorption after hypoxic injury. Does that have any relevance to any of the processes that may be significant in the development of Adam's cerebral oedema?

A. In a way it does, in that I'm interested in all of the processes which lead to brain swelling, the mechanisms of brain swelling. This research, again, is specifically directed at the differences in the brain in the first year of life from in later years. So the specifics of the research are not relevant, but the general principles of brain swelling are.

Q. Thank you. You have explained -- I think it was in your second report -- that you're not a forensic pathologist and therefore you don't feel qualified to comment on the specific conduct of that type of autopsy and that you can comment only in general terms on the neuropathological aspects of autopsy practice. And you attach some guidelines for us to assist with how the forensic pathologists carry out their work.

You attached guidelines for 2004. Have you since seen some guidelines of 1993?

A. Yes.

Q. And so far as you are aware -- and please say if you can't tell -- are those the guidelines that would have been applicable to Adam's autopsy?

A. Yes, I believe so, as it was in 1995. I'm not aware they were revised again until probably 2003, I believe.

Q. I'm just going to pull those references up. It's 306-072-001. Then if we go to the next page, one sees that under "general comments", it's envisaged that:

"These guidelines should serve for all hospital, coroner's and fiscal post-mortems other than Home Office cases."

And this wasn't a Home Office case, one takes it. When you say you are not a forensic pathologist, but Dr Armour was, are you able to explain what the difference is?

A. The forensic pathologist is usually involved in cases where there's a suspicion that the death may not be due to natural causes and the approach to the autopsy will be somewhat different, the degree of detail of the autopsy will be different from the autopsy which is designed purely to find a cause of death, which is the remit of the coroner's autopsy, or a hospital autopsy, which is to make a diagnosis and to do an autopsy which is for medical interest, which will have a different set of aims.

Q. But a non-forensic pathologist can find themselves assisting or providing expert opinion to a forensic pathologist?

A. Yes, a forensic pathologist will often -- will be responsible for the overall findings in an autopsy, but in doing so, may require the help of a biochemist, of a haematologist, of a neuropathologist, of a paediatric pathologist of various different specialists, who will write reports and then the forensic pathologist will usually incorporate these reports into his or her own report and write an overarching summary of the case, depending on what is said in those reports.

Q. Thank you. The autopsy into Adam was conducted in 1995. You are reporting for us last year and this year. How, if at all, does practice differ between what would have happened in 1995 in terms of the conduct of an autopsy on Adam and what would happen now?

A. There have been enormous changes over the last 10 to 15 years. 1995, we were just on the cusp of what became a huge problem relating autopsy practice, retention of organs, retention of tissues. I'm certainly aware that by about 1996/1998, a lot of pathologists were considering how they should conduct autopsies, how they should document them, how they should keep or not keep tissues, how they should ask for consent and so on. So all of this was beginning and then, of course, in 2001 there was the big publicity of the Alder Hey organ retention inquiry and subsequently the Human Tissue Act

was drafted and brought into law. So that made a huge difference to the way in which autopsy practice is carried out.

And on top of that, we've had increasing regulation and what is known as CPA accreditation, so laboratories and pathologists now are subject to accreditation and that involves a huge amount of paperwork, documentation, paper trails and so on, which are now considered good practice and actually are necessary for a laboratory to remain accredited. Whereas in 1995, many of these procedures weren't in place.

Q. I wonder if one goes back to those guidelines that I just identified, to go back to 306-072-001. This is simply, as you talk about the differences, nonetheless to describe, so far as you can, from 1995, how things were actually done. If you feel that you're not in a zone that is your comfort zone, you don't really feel competent to describe that, then please say so. But from your knowledge and involvement in autopsies and assisting forensic pathologists, can you help us interpret what this guidance actually means for what was happening? For example, if one goes to 306-072-003, that first section about demographic details, I think everybody can understand that.

If one looks at 2, "history", so far as you are

aware, how much history was being provided then in relation to the patient and where did that history come from?

A. I think I can speak about this in that I was performing autopsies myself at this time and indeed training trainee pathologists in autopsy work to a certain extent. It's not a large proportion of my practice -- neuropathologists do very few autopsies, but we are required to do them so we should know what best practice is. And we should have a history, prior to undertaking an autopsy, so that we know what the focus of that autopsy should be and what we need to look for because, of course, the practice, the autopsy practice, is a once and only chance to examine findings to take samples, after which are time the body won't available any longer. So it is the only opportunity we may have and we need to know exactly what we should be looking for.

Q. And where do you get that information from typically?

A. In the case of a hospital autopsy it would be from the clinicians who were looking after the patient, who will refer the autopsy to us, call us or write a formal request form and ask for our assistance, and will give us the background of the case and why they want an autopsy performed.

In the case of a coroner's autopsy, the coroner's

officer will usually provide a short summary of the clinical history and present us with that, but one would normally want the clinical notes as well if they are available.

Q. Forgive me if you have just said this, but if it's a coroner's autopsy, you want the clinical notes. Do you also want to speak to the clinicians as part of gathering together the history?

A. That's best practice. It's not always easy to do because, with a coroner's autopsy, a patient may have died outside the hospital. There may be no clinical records or the patient may have come from another hospital and clinical records are not available or the patient hasn't been in hospital being treated, so any clinical records are buried away in the hospital archives and it takes some time to recover those notes. So although we would want them, it can be very difficult to either get the notes or speak to a clinician.

Q. If it's a death in hospital, then are you seeking to make contact or have the clinicians make contact with you as part of informing you of the clinical history and context?

A. Yes, it's best practice and it's also, of course, expected as a professional courtesy that a clinician will phone and ask you to do this because they are

asking for your assistance in making a diagnosis.
Q. Are you there describing a hospital autopsy?
A. Yes.
Q. If we move from that to coroner's autopsy, does the same apply, that you're trying to also gain information about the clinical history from the treating physicians?
A. Yes, because in cases such as this, the patient was in hospital and all of that information would have been readily available.
Q. Then we see also that radiology and photography before the post-mortem should be considered. How routinely was that considered in 1995, photography?
A. I think photography was absolutely routine and certainly, in many places, radiology was routine as well, particularly with young babies where it's easy to have a small radiology unit as part of the autopsy. I think it's much more difficult in adults, but it was -- I think, in 1995, radiology was probably routine.
Q. When you say radiology was routine, just for the laypeople what does that actually mean?
A. X-rays, looking for fractures or, in babies, malformations of bones.
Q. In terms of the photography, what is being photographed typically?
A. Well, typically, I think forensic standards are very

different here. I think forensic pathologists usually take many more photographs than general pathologists do. One would typically photograph anything that was unusual and simply rely on descriptions of the normal run of pathology that one was seeing.

Q. If we then go over the page to 004, we see the external description. If we leave aside weight and height and go to external appearance, there are suggestions of what are included in there. If a body was bloated or out of the normal look in some way, is that something that should be included as part of the external appearance you're noting?

A. It should certainly be described, yes.

Q. Describe it?

A. Yes.

Q. Might you photograph it?

A. If you felt it was unusual, you hadn't come across it before, yes.

Q. We'll come to that in a minute when we go through the actual report on autopsy. Then we see the measurements of surface feature, scars and operation sites and bruises. Of course, Adam did have operation sites and scars and it says, "A clear description, including diagrams or photography". So in 1995, would you expect, as a matter of course, to have either a diagram showing

those things or a photograph?

A. Yes indeed, and it's usual practice to have a simple body map available in the post-mortem room. If there are multiple features to be noted, then they will be most simply put on to a body map, a simple diagram.

Q. I wonder if we could pull up 300-090-189. This is something that the inquiry compiled from the report of Dr Simon Haynes, who was the expert anaesthetist, just superimposed the description in the report on autopsy on this fairly basic figure. Is that the sort of thing that you're talking about?

A. Yes, because I certainly learn a lot more from looking at a picture like that than reading a detailed description of the anatomical site and the precise description. Both should be available, but it's much simpler to appreciate if it's represented in diagrammatic form.

Q. Then if we look at the internal examination, it says:

"Each organ system should be described in turn."

Although it's not being overly prescriptive about the order in which you put it. And then towards the bottom it says the organs that you would expect to see and where the weight would be given. Under (b), you see that's so of the heart, lungs, brain, liver and kidneys. Just so that we understand, these are all guidelines,

but are these what you would typically expect to see?
A. Yes, indeed.
Q. And then where we get to, histology. It says:
"To indicate what other material might have been saved."
Just so that we are clear, what sort of thing are they talking about?
A. If one, for example, takes a blood sample or a sample of the cerebrospinal fluid which surrounds the brain or a urine sample or some frozen tissue or a sample for microbiological study, which are fairly routine, then those should be noted.
Q. And then we come to the commentary and the conclusions. And you will know that the inquiry has also retained Professor Sebastian Lucas to also provide an expert view and he has reported on the report on autopsy and included his comments on this section about commentary and conclusions. But looking at the guidance that was in force -- not in force, but available at the time -- if one looks at (b):
"Reconcile as far as possible the major clinical problems with the pathological findings."
What is the exercise there that the pathologist is trying to do?
A. One is asked to try and explain the clinical findings by

doing an autopsy.

Q. So for example?

A. Well, if there's a sudden death after surgery, for example. We don't know what happened, could you look and see? So you would hope that at the end of the autopsy, you would be able to find something that would explain the question that you're being asked. So the point of the exercise is to answer those clinical questions, rather than just to describe your favourite organ or whatever. It's got a purpose and that purpose should be completed by reconciling what you found with the clinical findings.

Q. Yes. Can I understand the process? So you start, do you, looking at all that there is to see and seeing where that takes you in terms of what happened or do you start with a rough idea of what you think happened and see whether that can be evidenced from what you're looking at?

A. I think probably the most efficient way to work is that you're asked a specific question. Take something simple. A man found dead in the street with a knife in his back or whatever. You would look to confirm that that was the cause of death, you would look to make sure that there hadn't been a major heart attack or a bleed into the brain to explain it. And then you may say:

it's really interesting to see that other things were present. And this depends a little bit on who you're doing the autopsy for. The coroner wants to know a cause of death, so if you can say: yes, there was a knife in the back, it went straight into the aorta, the patient bled to death. It's very simple. That's all the coroner wants to know. You may find that this patient has the most fascinating brain disease, but the coroner doesn't want to know, doesn't want you to look at that because that will cost him a lot of money. So in that case you are simply reconciling your findings with the clinical question that's being asked.

Q. If you're presented with a scenario where a child, in this case Adam, dies after renal transplant surgery and not all the clinicians who are directly involved in it actually know why he died and can't seem to reconcile his death with the vital signs that they were receiving during the course of his surgery, so if it comes to you in that way, how, broadly, do you approach your task?

A. I think what one should do is to make out what we would call a differential diagnosis. In other words, we would make a little list of why a child may not wake up after an anaesthetic.

Q. Which could be like?

A. Well, the sort of thing is: did something horrible go

wrong and there was a huge haemorrhage? Did the child's blood pressure drop during surgery? Was the oxygen cylinder empty? Was there some complication of surgery like abnormal clotting or pulmonary emboli? So you would simply work out a list of things in order of the most common to the least common and you would have that in your mind as you approached the autopsy. So you'd look for things that would help you to either support or rebut a particular diagnosis and work through the list until in the end you would hope that you'd find the cause.

Q. Thank you. Then it says, though, because it may not just be as tidy as that, it says in (d):

"Present any inconsistencies in the findings."

Is it possible that you might not be able to give a conclusive view as to what had happened?

A. Oh, very possible, yes. In which case then one would want to think about which other expertise might assist you in making a diagnosis, should other specimens be sent, should other people be asked to come at the time of autopsy even. It wouldn't be unusual for me to ring up one of the other pathologists and say, "Would you come and look at this heart, I haven't seen anything quite like this", or, "I'm not sure if it's normal", and to get somebody else to come at the time or to think,

"Maybe I should send something off to the lab to see if there's some infection in the brain or infection in the kidney", or whatever. So you would think about what other services you may require and assistance you may require at that time and then, of course, there are later stages. If after you've completed the autopsy and you've looked at the tissues under the microscope, again, you might need further opinion or help, or to go back to the clinicians and say, "We're still a bit foxed here. We have to look at some other level of question about what might have been underlying this cause of death".

Q. When you're doing that, are you wanting to know whether any investigations have actually been carried out in relation to the death? So as not to put something so abstract, an actual situation. In Adam's case, at a fairly early stage, both the coroner and those in the hospital were concerned, as at one stage was the pathologist, that there might have been something wrong with the anaesthesia or the anaesthetic equipment. And the anaesthetic equipment was actually examined. There is a different issue as to the value of the results of that. In any event, the anaesthetic equipment was actually examined. Is that anything that a pathologist wants to know, what the result of that is?

A. I think perhaps one should just consider this in a temporal sequence, as it were. First of all, at the time of the autopsy, there are certain imperatives in that an autopsy has to be performed at a certain time. One wants to do it as soon as possible after death. One is there in the autopsy room taking samples and, obviously, one wants to complete it in a timely fashion because there will be requirements for the family to have the body and so on. So one needs to be very sensitive to that.

So one set of investigations that one needs to have in one's mind at that time, and what needs to be done fresh, what can't we do later, what are the really important examinations here and now? So if you're worried about an anaesthetic machine, that question probably won't come up until later. It is also not something that needs to be done at that time, but it's not something a pathologist would be primarily involved in.

So that's the sort of thing that would come later. You complete the autopsy, you try and make sure that you've taken all the samples that you need at that time because once the body has left, you won't have an opportunity to go back in the vast majority of cases. And then you have time to sit down, to think, to

reflect, and to talk again if you haven't come up with a diagnosis and go into it in greater details. That's when you'll go into the deeper layers of the differential diagnosis saying, "We have ticked off all of these things and we really can't establish a cause of death, we have to go on looking at other things", and that's when you might start thinking about anaesthetic machines.

Q. And how much discussion might there be in your experience between the pathologist and the coroner, if it's a coroner's autopsy, to try and make sure (a) that you have all the information that the coroner has, and (b) that you're assisting the coroner with what the coroner wants to know and not furthering science, if I can put it that way.

A. It depends entirely on the coroner. My coroner in Oxford has always been very relaxed about this and trusts us to get on and do what we need to do. As far as it is within the law, sometimes just allows us to do investigations which may not be entirely related to the cause of death, but which help us to understand the case. But that now has to be done with consent and he objects to paying for it. But essentially, he would normally allow us to get on with it. And we don't have very much interaction with the coroner at that early

stage. We would be dealing with the clinicians, trying to make a diagnosis and be able to write a full report at that point.

Q. When you say that you would be dealing with the clinicians, but in 1995 -- because I can appreciate this is something that might have changed -- how much recording do you do of what information you're getting from whom?

A. In 1995, it was probably really poorly recorded. We weren't good at documenting things. We may be a little better now, but it wouldn't be uncommon for me to go from the autopsy room and straight up to radiology or to surgery and say, "This is what I have found, how does it fit with what you saw at operation? Can we go and look at the scans together so that we can put all of this together?". And that would be very informal, but it would help me when I was preparing my report.

Q. If it's a coroner's autopsy, to what extent are you conscious that there might be some conflicts there?

A. Well, the current practice, I think -- and this is probably slightly different from in 1995. If there were a case where there may have been a conflict considered, if a patient had died in hospital and there was a question of whether there could possibly have been some negligence, that autopsy probably wouldn't be done

in the hospital, it would be sent elsewhere, and it's perhaps two or three times a year, I will get a sample sent from outside because it was felt that it's better that it's examined away from the hospital in which the baby died.

THE CHAIRMAN: Doctor, just pause there. You say this is probably slightly different from 1995. So in 1995, do I infer that you might then still have conducted the autopsy in the hospital, whereas you would not now do so if there was a query about negligence?

A. Yes. I think that may have been the case. I can't be sure.

THE CHAIRMAN: One thing that isn't clear to me is, what is the ... Why does it matter what the location of the autopsy is? Why does it matter? I think you were here when Dr Mirakhur gave her evidence earlier and she was describing the Royal site, which was quite big and there are separate units in it. Why would it matter that the autopsy was conducted somewhere in the Royal site as opposed to Adam's body taken off to a separate site?

A. It's not the site as much as the person conducting the autopsy. So it would be thought that if this hospital -- if a hospital may have been negligent in some way, it would be far better that the whole autopsy be performed in a completely different city by

a different pathologist, who may not have any conflict of interest with the treating hospital.

THE CHAIRMAN: Right. So it's more the relationship between the pathologist and the hospital?

A. Yes, I think it's more so that it can be seen to be a more objective examination and totally unrelated to any conflict the pathologist may have for his own establishment, his own employing authority.

MR BOYLE: Sir, I hesitate to interrupt, but it may be helpful at this juncture to look at some of the guidance, which I appreciate post-dates Adam's death, but which does still appear to be guidance in relation to this. It's at 206-004-083. It's the paragraph at 5.5.9. It may be of significance because it involves a perioperative event:

"Clarification and documentation of the often complex procedures and morbid anatomical results is more important than any potential conflict of interest if an adverse clinical event is thereby recognised."

I wonder whether you might want to establish whether in fact it might still be the case that guidance might suggest even where there's a potential conflict, one might still involve the clinicians who were involved in treating the child?

MS ANYADIKE-DANES: Yes, I was going to come to this later,

but we'll do it now since you have raised it. Can we go to paragraph 4.4.2, which is at 206-004-079?

These are the Royal College of Pathologists' guidelines on autopsy practice, which were produced in September 2002. If you look at 4.4.2, it says:

"Where it is thought desirable that the pathologist performing the autopsy should not be a trust colleague of the clinicians involved, that there may be a conflict of interest, a choice is to be made: an outside, independent pathologist possessing appropriate skills may come to the hospital or the body may be transported to another appropriately equipped mortuary for autopsy by the appropriately-skilled independent pathologist."

And sorry, your passage was?

THE CHAIRMAN: 5.5.9 on page 083. Can we put the two of them up together?

MS ANYADIKE-DANES: Can we put those two pages up together? Then if you can block off --

THE CHAIRMAN: 5.5.9, please.

MS ANYADIKE-DANES: There we are:

"If the case involves a perioperative or peri-intervention death, it is often advantageous to have the operator assist in the autopsy dissection. Clarification and documentation of the often complex procedures and morbid anatomical results is more

1 important than any potential conflict of interest if an
2 adverse clinical event is thereby recognised."
3 Are you able to assist on how one interprets this,
4 what the guidance was in 1995 and how one is to
5 interpret these two elements of the guidance?
6 A. I would hate to enter into this minefield. I think
7 the coroner is the person who has to make this decision.
8 THE CHAIRMAN: On the face of it, there is a discretion and
9 a judgment call to be made, isn't there?
10 A. Yes.
11 THE CHAIRMAN: In fact, 5.5.8 specifically advises that one
12 or more members of the clinical team should attend the
13 autopsy.
14 A. That's always desirable. But if there's a question of
15 a conflict of interest, it would be for the coroner to
16 decide which would take priority.
17 THE CHAIRMAN: Okay. Thank you.
18 MR BOYLE: I'm sure you have the point, of course, that
19 4.4.2 states that:
20 "The pathologist performing should not be a trust
21 colleague of the clinicians involved."
22 Which, of course, those in the state pathology
23 department here in Northern Ireland were not trust
24 colleagues of the clinicians.
25 THE CHAIRMAN: Dr Armour is not an employee of the Royal

trust or the Belfast Trust, as it is now. She was then employed by the state pathology department.

MS ANYADIKE-DANES: Yes, although Dr Mirakhur was, but I think the chairman has the point.

If the autopsy is to take place outside of the hospital's environment, if I can put it that way, how do you deal with getting the information from the clinicians, which you may nonetheless feel is important, whether or not there are conflict issues, how do you go about getting that information?

A. I think this is a very difficult issue, and I don't know, I haven't been involved in such a situation where there is a conflict and yet one needs the complex information, because I think, as far as I'm concerned, as a pathologist, I'm always very grateful if the clinician comes to the autopsy, particularly if it's a night when I was working at Great Ormond Street and doing cardiac autopsies I would far rather the surgeon came and explained exactly what he had done to the complex anatomy of the heart. And now, if I do an autopsy for the neurosurgeons, I very much appreciate it if they can come and explain exactly what they have done, which will help to unravel the complex picture we have when we have pathology plus surgery plus pathology. The picture can become very complicated.

Q. If in receiving that information, which is useful to you, it becomes clear that you have a different view from the clinicians who are giving you the information that you're seeking, you record your view obviously, but do you in any way seek to record the fact that you've received information from one or other of the clinicians and you simply have a different view or do you simply just put down your view?

A. I think what one tries to do is to record the objective evidence, the objective and relevant clinical evidence and one's opinion, based on the clinical opinion or the clinical information that one has, the evidence that one can identify and then one makes a professional diagnosis based on that information, and I think opinions probably would be not part of an autopsy report.

THE CHAIRMAN: Well, you have seen Professor Lucas' report.

A. Yes.

THE CHAIRMAN: He has some criticism of Dr Armour, but one of them is that she actually has too much information in her report. So getting into a debate between clinicians would clearly be going too far, wouldn't it? Because the coroner is not asking for an opinion from the pathologist on a debate between clinicians. That's way outside the remit of the pathologist, isn't it?

A. I think that's correct. I think the pathologist should

be looking at objective evidence and making up his or her own mind, which will be an opinion. But other people's opinions are not part of that report.

THE CHAIRMAN: Thank you.

MS ANYADIKE-DANES: Can we then go to two final parts of these guidelines? 306-072-006.

THE CHAIRMAN: Is it 306 or 206?

MS ANYADIKE-DANES: It's 306.

THE CHAIRMAN: So you're back to the earlier one?

MS ANYADIKE-DANES: Yes. Well, I think I had gone to that part because one of the counsel wanted specifically to look at that element. I'm now going back to the guidelines that I think have been identified as the ones that were likely to be in practice at the time.

Then if we look at this, the minimum guidelines for post-mortem investigation, and if we leave the post-neonatal/infant deaths, is this something that would apply to Adam, so far as you're aware?

A. This is actually for infants, and I think that's a slightly different category. We're talking about a child of 4 here. So a lot of different considerations --

Q. So infant would mean someone slightly younger?

A. Under 1 year of age.

Q. Under a year, thank you. Then if we go over the page to

306-072-007, neuropathology. This is a part of the guidelines which would have applied to Adam's autopsy, so far as you are aware?

A. Yes, I believe so, yes.

Q. And so if we look then at what's being required here, it says:

"The main points which should be noted in post-mortems involving neurological ..."

Would Adam's case be a post-mortem involving neurological --

A. Yes.

Q. It then refers to four guidelines, and I'm sorry, Mr Chairman, we have not been able to find those four guidelines for you, they no longer retain them in the archive. But we're still trying and, should we get them, we'll provide them to you, because it may be they'll be relevant to other deaths as well. In any event, this is what we have. Then it says:

"The pathologist should consider whether cases need referral to regional centre of neuropathology."

And you would have heard Dr Mirakhur's evidence. That actually was Belfast, the Department of Neurosciences in the hospital was the regional centre for Northern Ireland. So that presumably is somewhere that the pathologist could have considered to refer

Adam's case to formally.

A. Yes.

Q. And just if we pause there. The details and information that you have received of Adam's case, would you have considered such a referral would have been appropriate?

A. I think so, yes.

Q. Then if we move to the external examination:

"CSF [central spinal fluid] should be taken before starting."

Should that always be taken in your view?

A. It's good practice. It doesn't always happen, but it is good practice.

Q. And why are you taking it?

A. So that any unusual features, for example an infection, meningitis, or a biochemical abnormality could be identified. So it's possible to take the sample, either to send some of it for immediate culture in a microbiology laboratory or simply to freeze it so that it's there for future reference if an unexpected question arises.

Q. Is that one of those sorts of samples that you really do have to make up your mind you're going to take it fairly immediately because otherwise it gets lost?

A. You have to take it absolutely before you start, because otherwise once you start opening the head and removing

the brain, blood gets into the CSF and contaminates it. So it's usually by a needle through into the lake of CSF at the back of the brain before starting.

Q. Thank you. And then it goes on with histology and the dissection of the neck. When it refers to the carotid vertebral arteries, it talks about removing them en bloc. Do you do that even if you're not sure whether there's going to be an issue there? It's one of those things that you remove?

A. I think I've probably done that twice in my life. It's extremely unusual for us to do that. But were there to be a question of a vertebral artery aneurysm or rupture, then one would certainly do that.

Q. When it talks about the examination of the skull and brain, this is something that's being done before you get into the situation of taking the fresh brain out. So how important is that bit of the examination? It has as guidance that you conduct:

"(i), a careful examination of the scalp [and so forth]."

And particularly:

"(c), special techniques being needed for examination of the posterior fossa or upper spinal cord [and so forth]."

But if one starts with the very basics of carefully

looking at the scalp, how important is that?

A. It's terribly important because it's very simple and it's part of a basic observation and it shouldn't be part of a guideline so much as common sense that you're going to look at what the head looks like. Is there any evidence that something has directly happened to the head? Is there evidence of impact? So it's something that doesn't require special samples or special techniques and so should be an intuitive part of any autopsy.

Q. And these things that you're receiving guidance about doing, are they all things that you should record in your report on autopsy?

A. Well, I think examination of the scalp and skull or the head, for example, should be part of the examination as we've already discussed, the external examination of the body. It should certainly be recorded there, yes.

Q. And recorded?

A. Yes.

Q. Then the reference to special techniques for the examination of the posterior fossa or upper spinal cord. Why is it important that you use special techniques for that examination?

A. There would be special circumstances. So in most cases, one wouldn't do that. But for example, if a patient has

just had spinal surgery on the neck or I had a case recently of somebody who had an injection into a painful nerve root. In that case, you would want to look very carefully and, in order to look at the nervous system, the back of the brain and the upper spinal cord, you do need to use a technique like this so you can look at it intact without damaging -- trying to get it out at autopsy.

Q. Okay. So that we're clear then: these are all guidances as to things that you should do, but is there an element of judgment from the pathologist as to whether this is an appropriate thing to do, given this particular case?

A. Very much so. Taking out neck blocks like this or taking out the vertebral arteries would just not be routine practice. You would simply do it where you felt it was necessary. So these are perhaps best practice covering the whole spectrum of possibilities. In any one autopsy one wouldn't undertake all of these procedures.

Q. But are there nonetheless some of these things that should always be done and always be recorded?

A. Yes. And I think those mostly fall into the sort of category of the simple and the common sense things.

Q. And is the central spinal fluid, taking that, one of those things that really ought to be done?

A. I think again that isn't always essential. Very frequently now, patients will have had CSF taken before death and there will be a good record of that, so one may not be adding anything at autopsy. Again, I think that's a matter of judgment.

Q. Thank you. And then over the page, 008, it deals with the preliminary inspection of the brain and dissection. The guidance about fixing the brain and so forth. Then the dissection, if we go to (b):

"Routine blocks should normally include."

And then it gives a whole series of where you should take those blocks from. If we take the first, which is the dura, what's the significance of taking blocks from that particular area of the brain?

A. Well, maybe I could take us back a step because we discussed looking at the scalp and the skull, and there was a comment about not causing fractures. It's also very important that one should look at the lining of the skull to make sure there aren't fractures in the skull because this can only be done at autopsy. And also, that one should look at the dural venous sinuses which I already mentioned, because they are draining blood from the brain and this is something, again, which can only be done at autopsy. So it's important to look to see that they're patent because a thrombus or clot

forming in those sinuses is a very powerful cause of brain damage. They should always be inspected at the time, and further, if one takes a sample of the dura from the appropriate place, it's possible to see if there has been clot, if there may have been a previous clot which has since healed and scarred that part of the vessel, or if there is bleeding into or beneath or above the dura -- evidence of old trauma, for example.

So one can gain quite a lot of information from looking at samples of the dura if they are taken from appropriate sites and I'm just very surprised that, in this guidance, nowhere does it make reference to examining the sinuses because it's a very important site in terms of brain pathology.

Q. And do I understand you to say that some of these things that you should do at the outset -- I presume it's a progressive examination from what happens at the surface moving in to more internal structures and that if these things are not done in that order, then you don't any longer have the opportunity to know what that might have told you?

A. Exactly right. So when one's taken out the brain, which is a difficult technique and it needs to be taken out very carefully and put into fixative so it's protected, then one should after that, look at the inside of the

skull, examine the sinuses and take any relevant samples. Then we move on to the next stage, which is examining the brain, the dissection, examining the brain after it has been placed into fixative so it's more easy to handle.

Q. Thank you. Now that we've got that, we do actually have some photographs and diagrams so that we can try and understand the significance of some of these structures that you refer to in your report. These are going to be photographs of Adam's brain and there will also be some photographs of other brains for comparison purposes.

I wonder if we might first go to reference 300-076-140. I wonder if it is possible to pull up alongside that 300-097-001. On the right-hand side, those four sets of diagrams are diagrams that the inquiry's own legal team have sourced, so apologies if they're perhaps not the best for illustrating this, but sometimes it's easier to see in diagrammatic form.

If we look to the left, can you help us by reference, if it does help, with any of the labelling on the diagrams on the right, what we're actually looking at?

A. The photograph on the left is a black and white photograph which was used, I believe, in Dr Armour's publication of this case, and it's looking at the

undersurface of the brain and its exact equivalent is the bottom right-hand side of the four pictures on the right side. So that's the one, yes (indicating).

Q. Would it help to see it in colour? Does that assist?

A. It does to a certain extent because it tells us whether it was the fresh brain or the fixed brain.

Q. If you give us a moment, I will see if we can find the colour version of that. Meanwhile, could you continue to explain what we're looking at?

A. On the left, we have the major part of this picture is the undersurface of the cerebral hemispheres, the main parts of the brain which are shown in orange and green in that lower right-hand picture. And then the back half or the lower half of that picture is predominantly the cerebellum, which I think was blue until it was coloured in. But that's -- that's right, the blue part is the cerebellum, which is the separate, smaller part of the brain at the back. And then in the middle of that area, in the midline, one can see two little rounded structures beneath the rather deep, dark hole there in the midline. That's a bit of shadow, I think. But those two structures are in fact called the optic nerves and they are labelled on that bottom right picture, little white structures about halfway down. Those are the nerves which supply the eyes. So we're on

the undersurface of the brain and those two would come into the back of the eye sockets.

Going downwards in the picture from there, the most prominent structure here is the vertebral artery which, which is the dark line in the middle. That's the main blood vessel coming to supply the back part of the brain, and that's, I think, not represented in this picture, but it's overlying what is in purple, the pons, in that picture on the bottom right. And lower down from that on the picture on the right, we have quite a long purple structure called the medulla oblongata, which actually joins up with the spinal cord, so that's where the brain and the spinal cord become continuous.

In the photograph on the left, we can see the pons quite nicely with that vertebral artery in the midline and then everything becomes a little bit less easy to see. I think, just to the right at the lower part of that artery, there's a sort of rounded structure, which I think is the lower part of the medulla where it was cut when the brain was removed.

MR BOYLE: We can make a colour comparison because --

MS ANYADIKE-DANES: Yes, we have 300-081-159. I was trying not to interrupt the flow. Can you orientate that round so that --

A. 90 degrees to the left would be brilliant.

Q. Turn it 90 degrees to the left.

THE CHAIRMAN: Let's take a moment. That's on to the next page. We're looking at 159. If you can turn that to the left ...

MS ANYADIKE-DANES: That's it.

THE CHAIRMAN: If we can then --

MS ANYADIKE-DANES: And put the diagram up that you had before. Perfect. Thank you very much indeed.

It's actually clearer like that, the description you were giving of the structures.

A. Yes. So if we go back to the midline, below the mid-part of this picture, we have the pons and we can see that is the basilar artery, which has a purpley and a slightly blue colour because there's a little bit of blood in it still.

THE CHAIRMAN: Sorry, doctor. One moment.

Does the doctor have the facility on her screen for pointing? No? Okay, sorry.

MS ANYADIKE-DANES: I think our IT people can point. There we are.

A. If that arrow goes down a little bit, where the arrow is just about now, it's overlying what I think is the lower cut end of the medulla. You can just leave the arrow there. The head of the arrow is exactly on a little rounded white structure, which is where the medulla has

been cut off. So if we go down to the bottom right, there are some little yellow arrows, the lower ones, of which -- which are pointing inwards to the middle. They're exactly pointing to where I think this has been cut off in removing the brain.

So that orientates us on the back of the brain here, so we're right in the back of the skull, and the brainstem, the medulla, has been cut just about at the point where it goes into a hole called the foramen magnum, which is a hole in the base of the skull, where the skullbone is attached to the upper part of the spinal column. This is an important area because that bony ring around the upper medulla is a constraint. The medulla goes through it in life, it has space around it, it has fluid around it, but if the brain swells, the brain tissue can be pushed into that hole and then there's not room for everything, something gets compressed. The cerebellar tonsils as we call them, the posterior part, becomes necrotic and we can live without those, that's absolutely fine, but it will compress the medulla which is where all the vital centres for consciousness, breathing and heart rate are to be found. That's what causes sudden death in brain swelling. So that's a very important concept, which is known as coning.

Q. Just before we go forward, so that we've got that, can we just provide another diagram to show that happening? 300-088-186. If one looks, does that assist you in, certainly the bottom one, figure 1(b), in describing this process of coning?

A. Yes. In the bottom figure there, you can see the skull represented as a square box and, at the bottom, there's an arrow or a line pointing to the foramen magnum, that is where the spinal cord is coming from the back of the brain. Where the word "brain" is is just about where the cerebellum is in our picture, and the spinal cord is coming from it into the spine and it says "spinal subarachnoid space". So that wiggly line is the tissue sac that contains the spinal cord, but that also is in the bony canal of the upper spinal column itself. That foramen magnum is the space there -- the space there is the hole through which the spinal cord comes in, in normal circumstances, and in brain swelling the brain is forced out through that hole as well.

Q. We can see in that one, if you look at the top of that box, what's representing the brain seems to be up tight up to the top of that box as compared with where it is in figure 1(a) where there's space around with the central spinal fluid and so forth.

A. Yes, but it gets even worse because in the bottom

picture you can see the brain has sort of come to rest on top of the foramen magnum, but what happens is that brain will actually be forced into it. And that tissue will become necrotic. We can see that in the picture on the right, the picture of the brain itself, because just to the left of where that second red arrow is, you can see the tissue there is disrupted, it's red. It doesn't look like the tissue next to it, where you can see some fairly regular lines. There's the folds of the cerebellar hemisphere, they're nice and orderly, but in the midline it becomes red, disrupted, disorganised, and that's because that tissue has been forced into the foramen magnum and has been damaged and become necrotic. It's dead tissue.

Q. When that happens, what's the effect of that?

A. The effect of that is not very much on the cerebellum itself. But the effect on the brainstem is that the brainstem, the medulla, is compressed and rapidly loses its ability to function.

Q. If we bring back our other diagram that we had before, which is 300-097-001, and then if we pull up in place of the 300-081-159 -- and I do hope this is going to be a colour version of it -- I apologise if it's not -- 300-081-161. There we are. Can you do the same action to turn it around? What are we looking at here?

A. We're looking at the top of the brain here, so exactly the opposite side. So looking down as if on to the top of the head. We don't have a diagram showing this exactly, but it would be looking down on the top left picture in the bottom, well, either of the --

Q. The top of (d)?

A. The top of (d), yes. Or if you look at (c), we'll be looking down from above, where it says "left frontal lobe" and "central sulcus", we would be looking down. So we're looking down on the brain from above. So we see the two cerebral hemispheres here and, in the midline, they're slightly separated, slightly apart, which is the way they have just fallen after autopsy.

In life, they would be parallel to one another and quite close together and there would be a fold of the dura between them. Here, they're looking perfectly undamaged, but just have fallen slightly apart. And at the lower part of the picture, we're looking down on the cerebellum again, so we have just looked at the bottom where it was damaged. Now we are looking onto the top surface and it looks very well preserved from this side.

Q. Having looked at both those photographs, is there anything, any comment, that you can offer as to the appearance of the brain itself, the gyri, how they

appear?

A. The pattern of the folds in the brain look as if they're perfectly normal. One can still see that they have a slightly rounded appearance. You can see in some areas how the light reflects on them. They still have a certain roundness to them. And the normal hollows between them are just about visible. In some cases, there's perhaps a little bit of flattening, suggesting there may be some brain swelling. One can see that the brain appears a slightly pinkish colour, it's a little bit congested, there's perhaps more blood in it than normal. And one can see little blue lines on the surface of the brain towards the midline, particularly. These are the veins which are taking blood away from the brain, they look healthy, perhaps a little full of flood.

So the appearances are of a brain which shows normal developmental appearance and a little swelling.

Q. And when I mentioned to you the gyri and you were talking about the normal folds, if we look to the diagram on the right-hand side, up at the top, it has a little bit of identification in yellow and then the sulci. These are references to the swellings and the grooves between them; is that right?

A. Well, they're normally -- the brain is normally a series

of folds like this (indicating) where the tissue is folded and the folds have a sort of rounded appearance and the valleys between those folds be reasonably closely opposed. When a brain swells, the tissue will expand and the brain is going to come into contact with the inner aspect of the skull or the dura lining the skull and so the contours will be lost because the tissue just comes up against the skull and it becomes flattened, so we lose those rounded contours of the gyri. We can still see where they are and we can see the sulci between them, but they become effaced and --

Q. Is that one of your markers for an oedematous brain?

A. Yes, it is.

Q. Then we have some sections -- so this would be after it's taken out. Is this a fresh brain?

A. I think it is because of the colour, yes. When it's fixed, it becomes a more browny sort of colour.

Q. So this would be the subject of examination then and recording, I think, from what you have said? This would be recorded or, in your view, would be recorded in the report on autopsy, this appearance?

A. Probably a brief examination at this period. One has to remember that, at autopsy, the brain will be very soft and, in order to examine it in detail, one can cause a lot of damage to the soft brain. So quite often

it would be normal to make any simple notification of what's there and then simply to put it formalin and do a more extensive examination after fixation.

Q. There are sections that were taken of the brain after fixation. We can see those at 300-081-157. This is the changing colour that you're referring to.

A. Yes.

Q. Can you help us with what we're looking at there and how it helps in terms of what happened to Adam's brain?

A. We're looking at what is called a coronal slice of the brain. Once the brain has been fixed, it becomes firm enough to handle and the normal procedure is to remove the cerebellum and brainstem and then to cut the hemispheres into coronal slices. That is going, as it were, from ear to ear, one centimetre, all the way through the brain so that we then lay out slices so that you can see the whole of the brain at 1 centimetre slices from front to back.

Q. I wonder if I can show you something and maybe this will help. 300-075-138. If one looks at the bottom right-hand corner -- and these were the slices of the CT scan that was taken shortly after Adam's surgery -- it's difficult to make out, but you can sort of see every 5 centimetres there's a line going, which represents one of these pictures, I understand. Is that the kind of

systematic slicing that you're talking about that would be happening when you see those samples?

A. We do it the other way. CT scanners do it horizontally. We've always done it in the coronal plane and when CT scanners first came in, we were being persuaded to cut brains in the horizontal way to match the scans. But now computers have become so sophisticated that they can just press a button and they can orientate these in any direction. So we continue to cut in the coronal plane.

Q. But the principle is the same? You're trying to systematically move through the brain taking samples?

A. Exactly, so that we can examine the brain from front to back and look at all of the structures.

Q. I understand. So if we go back to where I had taken you, 300-081-157. What is this telling us? It's a slice through the brain.

A. Yes, and what we can see is all the way around the surface of the brain is the cerebral cortex. That's where the main bulk of the nerve cells, which do all our thinking and functioning for us, are to be found, and if you follow that around you can see a nice regular, even ribbon, which weaves its way up and down over the gyri and between all the gyri are the sulci, which here are represented as little narrow dark lines because there are little tiny blood vessels in the membranes covering

the brain, tucked in there. And we can see those little lines are simply that: they're not very open, which suggests, possibly, a degree of brain swelling.

If we, for example, take the right-hand side and we go from the middle of the picture and work over the top, as we go out over the top and down towards the right, we can see the folds are still just about identifiable. You can see there is a rounded edge to some of these folds. So although the brain is swollen, there is -- it's not as swollen in this region as it might be. Beneath the cortex, the rest of the tissue is a whiter colour, that's because it's the white matter, it's the nerve fibres, which are covered in what we call myelin, a sheath that insulates the nerve fibres, so it has a whiter appearance. You can see little black-grey dots which are blood vessels which are congested, so that tells us that the blood hasn't been escaping from this brain perhaps as freely as it might. So all the little blood vessels have become full of blood, so they're quite visible even to the naked eye.

Q. There are a series of these.

THE CHAIRMAN: Sorry, I'm not quite sure what the purpose is of going through these. I accept we have Dr Squier's report. I'm not quite sure what the point is of going through these.

MS ANYADIKE-DANES: What I'm inviting Dr Squier to do is to explain, other than just to read her report, the evidence that she used to enable her to produce the view that she did as to the extent of cerebral oedema that is described in her report. But I'm not proposing to take her through them all, but there are some where -- and this may be relevant for her to explain -- the gyri appear more effaced than others and where that particularly happens may or may not be significant from the construction that other people will put on that or may put on it.

THE CHAIRMAN: Well, I'm sure we don't need to go through them all.

MS ANYADIKE-DANES: No, I wasn't. I'm not qualified to say where the gyri appear more effaced than others, so I was going to simply flick them through and ask Dr Squier to identify one of those and to help us with an explanation of what region that's happening in and what its significance is.

THE CHAIRMAN: Okay.

MS ANYADIKE-DANES: These happen -- fortunately --

MR FORTUNE: Do you mean the dura?

MS ANYADIKE-DANES: The gyri.

You have just described these as being relatively nicely rounded, you can still see the gaps. Maybe you

can give us a description of one that doesn't appear like that and its significance, if there is any to it. So 164.

A. Fairly similar, this one.

Q. 165?

A. Yes, again -- perhaps I should just say here, in the midline, one can see a sort of white band crossing between the two halves of the brain. And beneath it there's some black cavities there. Those are called the lateral ventricles, which are the normal fluid-filled spaces within the brain. And these look a little bit compressed. Not completely flattened, but there is -- they are smaller than they should be and this again is a reflection of brain swelling.

Q. 166.

A. Same thing. This one is a little bit more swollen. One can see the black blood vessels spotting the whole of the brain as slightly more prominent and the surface is perhaps a little flatter than the previous sections we've looked at.

Q. 167.

A. Again, this one looks swollen. It's also rather disrupted, which an indication of swelling because the tissue is very soft.

Q. Maybe these last two, 170 and 171, if we can maybe put

those up together.

A. Again, we can see the cavities within the brain tissue in both of these sections, which are still open, and I think this is important when comparing with the brain scans. And we are right at the back of the brain in these two slices. But I think the only other thing that might be helpful is to look at the cerebellum perhaps.

Q. Could that be 175? 300-081-175.

A. That's right, yes. Okay. So this is looking at the cerebellum when we have a slice which is going at a slightly different angle here. So we can see the two halves of the cerebellum and the -- its central anatomy as well. On the left side, where it says "14" there, there's been a block taken. You can see some lines because cuts have been made into it. But the point here is that the whole of the grey part, the outer half of the structure, should have a series of nice, regular folds -- much smaller than the gyri in the cerebral hemispheres -- but they're very difficult to identify, they've become very compacted so we can't see the normal anatomy and in the deep part of the structure on either side, not the midline, you can see there's whiter tissue. That's the white matter. But everything looks rather blurred and this looks very swollen and it looks much more swollen than the -- than much of the cerebral

hemispheres, although there was swelling there. It seems to be rather more focal in the back part of the brain.

Q. There are some comparisons with more and less swollen brains, just so that we maybe know what we're looking at. There are only three of those pictures. One is at 300-058-076. These are pictures you have provided. The left-hand side?

A. This is a 2 year-old child with a very swollen brain.

Q. How can we tell that?

A. Just -- particularly, the left half of this brain, it looks completely flat. You can't see any light reflex over the gyri there, they're just completely flattened and the spaces between them have been effaced. The membranes are very dark, indicating they're really full of blood.

On the right side, this is a 10 year-old child who didn't have swelling. The gyri are more obvious there, and I will say immediately that it's -- I found it very hard to find suitable photographs for you because so much of this is objective assessment. Those are my opinions when I saw those brains and I would be at pains to try and convince you that the gyri were still very much more prominent on the right side than on the left.

Q. But it appears that way to you?

A. It appeared that way to me when I examined them fresh.
Q. If we look at the one over the page, 058-077. You have put them all in a row, those three. Adam's is the one in the middle, is it?
A. Yes, and I think the most obvious thing that I can point to here is that, first of all, the one on the left has become turned upside down. So we have the back of the brain, the middle picture and the right picture. That is Adam's brain that we now recognise. You can see there's a white arrow pointing to a space between the medulla and the cerebellar hemisphere on the right-hand side and the black arrow is pointing to the back of the cerebellum. This is the part which are in Adam's brain is completely haemorrhagic and destroyed and there's no space. In Adam's brain, we can see that the tissue's so destroyed that there's actually now quite a lot of space around the medulla.

In the picture on the left side, if we now look at the top -- this is 90 degrees -- 180 degrees reversed -- so at the top, we can see that there is a lot of very dark, poorly defined tissue around the medulla because there's been so much compression and swelling there that it's completely -- the space has gone and the tissue is damaged much as in Adam's case. So those are really the extremes that we're seeing with

Adam's brain in the middle there.

Q. And then the final one to show the comparison of sections is the next page, 078. Adam's one is numbered "4".

A. Yes. And it's really to look at the ventricles, which are the spaces in the brain. On the right we have the ventricles. The spaces are much bigger with a rather rounded angle to them. That's, in fact, slightly larger than normal. But compare Adam's in the middle with the one on the left, where there's just half a brain, and the black arrow is pointing to where the space should be. But there's just a little line. It has been completely effaced. So that's very severe swelling on the left. So the point is that in some parts of Adam's brain, the swelling appeared to be much less obvious than in other parts. So it wasn't globally swollen, at least compared with other brains that I have seen.

MR BOYLE: Can we just establish whether the image in the bottom left hand corner is an image of a fresh brain as opposed to the image with the number 4, which of course, is fixed?

A. It is a fresh brain. Sorry, I'm not sure that I can say that. I think it's not a very well -- it's not a very well fixed brain. The red colour in the middle is because it hasn't completely fixed in that area. The

formalin penetrates from outside, so it has been fixed because the outside has this brownish colour, but the formalin hasn't completely penetrated.

MS ANYADIKE-DANES: All those photographs would have been taken at autopsy, which is some hours after Adam actually died.

A. Sorry, these would have been taken at brain cut [OVERSPEAKING] so fixation. So autopsy or -- death is the important point because then the changes will cease to continue. We believe that the swelling and so on will stop at death and then there will be the autopsy and then the brain is fixed so what we're looking at here is the fixed brain where we think things are pretty much the same as they were at the time of autopsy. So fixation actually makes all the proteins in the brain cross-link. They become firmer, so the brain becomes harder, a bit like boiling an egg. So instead of having a fluid, clear protein, we have a protein like in the hard boiled egg, which is firm and white and we can cut it. So we're doing a similar thing to the proteins in the brain by fixation.

Q. But it shouldn't change anything between the point of death and the examination on fixation?

A. No, such things as swelling and the pathological processes will be fixed, as they are.

Q. So the true contrast might be the point of death and the point of any imaging that might have been taken closer to the time of the event, which in this case would be the surgery?
A. This is the most important point as far as I am concerned. We, as pathologists, see the end point when death occurs. In this case, we had some 24 hours between whatever event may have occurred and death, during which time Adam was subjected to intensive care, where a lot of secondary changes could have taken place. So as pathologists, we only get one shot at that time when all of these processes have been going on for 24 hours after whatever event it was. And we have a lot to learn by looking at the images of the brain because they're taken during life. They can be repeated and they can be very much closer in time to the events. So they will give us a much better picture of the evolution of the changes and a much better representation of the pathology closest to the time of the event.
Q. So in terms of when the pathologist is looking at the brain at autopsy or looking at the sections of the brain on fixation, if I understand you correctly, quite a bit may already have happened between when the main event occurs, if I can put it that way, and the point of death, which it's assumed that these examinations

represent what the brain would have looked like at the point of death and might those things be the fact that Adam, or a child like Adam, where there was concern about fluid overloading, might have received medication to reduce that, might have been on -- well, was on ventilation. That might produce effects. The passage of time might itself produce effects. Are those all things that may go to make what the pathologist looks at, at that point in time, perhaps not a true representation of what the state of the brain might have looked like at the time of, let's call it the assault [sic] or the event?

A. That's absolutely right. And when we're looking at things like brain swelling and possibly -- well, certainly bleeding, these can be very, very much affected by the clinical state of the child and certainly by ventilation. So a child who's very sick is likely to bleed more than a normal child because the liver may be involved and the coagulation of the blood won't occur normally. But also particularly swelling because there would have been therapy that would have been given to Adam to try and reduce any swelling. But also when a baby is on a ventilator, there may be reduced oxygen supply or too much oxygen supply. All of these can affect the way the brain or the swelling of

the brain -- but more importantly, as the brain swells it will cut off its own blood supply as it fills up the skull, the blood won't be able to get in, so the brain will be suffering from lack of oxygen and that in itself causes swelling. So we have a lot of secondary factors. So what we're seeing at post-mortem really is a very complex picture and we have to be very careful to understand that it may not be an accurate representation of what happened at the time of whatever event it was that precipitated the whole cascade.

Q. In fact, in Adam's case, you do have two sets of CT scans, one of which might almost be called a control, taken at 7 July 1995. In fact, we can pull that up. 300-083-181. I wonder if it's possible to enlarge that just a little bit. Maybe not. If you look just at the scan, the scan 2 at the top there, you can see it gives you the date and it gives you the time and it gives you the number. So these are a sequence, are they not? There we are. Can we go back to the full thing again?

If one goes to the bottom right-hand image, is that what I was asking you about in terms of the sections for your examination to show where all these pictures come?

A. Yes, that's the registration picture, so it's just a picture of the whole head and which plane and at what interval and depths the scans could have been taken.

Q. I don't know if this can work because it's rather broad, but we also have one on 27 November. That is taken within a few hours. Sorry, that is 075-138. 300-075-138. There we are. This is the one that was taken within a couple of hours, really, of Adam's surgery. The same principle, I take it, as the identifying shot at the bottom and then the series of images.

What do the images tell you? Firstly, is it possible to get the two alongside each other? They may be too wide to do that. So to the left-hand side is the one of 27 November and to the right-hand side is the one of July. What are you able to tell from these?

A. I'm not a neuroradiologist, so I'm not in a position to give you an expert opinion on these scans.

Q. Did you seek that for the purposes of your report?

A. I took them to my colleague, Dr Anslow, and asked him to look at them with me, and he has produced a report.

Q. Yes. He has produced a report; I'm just trying to get it for you. I'm not asking for it to be pulled up, but simply for reference purposes it's 206-005-109. Did you discuss his findings with him?

A. I did.

Q. And what do you understand to be the difference between these two sets of images?

A. Well, I'm going to keep it very simple.

MR BOYLE: [Inaudible: no microphone] because I think it is important if this evidence is to be given. So we have the paragraph number, which is paragraph 100 on page 206-005-111. It gives a comparison at lines 95 to 100 of the two.

MS ANYADIKE-DANES: There we are. So Dr Anslow's saying he saw the two scans: the first on 7 July; the second on the 27th. And he describes very briefly what he has seen:

"The first scan was normal. Central spinal fluid was seen on the surface of the brain and the ventricles."

In the second, he saw a dramatic change:

"The brain has become very swollen. Central spinal fluid spaces have become obliterated and the ventricles are much smaller. These changes are severe in the posterior fossa and the cerebellar tonsils have descended through the foramen magnum. The second scan indicates that the brain has developed oedema."

If we go back to the two sets of images, when you were discussing with him, were you able to see from these images the evidence that he obtained for him to reach that conclusion?

A. Yes. And I could briefly take you to this. If we look

at the top right-hand picture in each of these sets of images. So the top right-hand picture on the right-hand side is, I believe, the July preoperative image.

Q. Yes.

A. And we can see, in the midline, of that picture there are three black areas. That black is fluid, which is the equivalent of the ventricles we were looking --

Q. Sorry, let the marker go -- there you are there. If you can pull that up and increase it a little bit. It's a different marker to do that. Right.

A. So what we're seeing in the middle of the right-hand picture is a black area and then there are two black areas behind it. Those are normal fluid spaces. In the lower two are -- around the cerebellum, so we're at the back of the brain here and you can see there's a black space with fluid. If we look at the left-hand picture, those three spaces have completely disappeared because the fluid has been pushed out because the brain is so swollen.

The structure of the brain has changed in that in the right-hand picture you could make out that wavy white band of cortex, particularly in the upper two-thirds of the picture. That's really quite clearly seen. On the left-hand side, that's been lost, the whole thing look like ground glass because the brain is

so swollen that the normal architecture has been lost by the fluid in the brain itself.

So we're seeing much more -- well, we're seeing swelling in the left-hand picture, which is manifest by a change in the structure or the appearance of the structure of the brain and the loss of those fluid spaces.

Q. And if we were to go back to those two sets of images, are you able to discern from them where the swelling is being described as being much greater? I think the actual terminology used was "changes are severe in the posterior fossa".

A. The posterior fossa is the lower third of each of these pictures which I have just described. The black spaces have disappeared, the fluid spaces have disappeared. I think if we go back to the main picture --

Q. Yes.

A. If we go to, for example -- it's hard to find two that are comparable. I think in the third line down in the right series of pictures, sorry, the right-hand ... If you can perhaps highlight -- that one's perfect there. Perhaps the same on the left one, the third line down. I don't think these are completely comparable anatomically, they seem to be at slightly different levels. But again we can see, on the right-hand side,

in the early scan you have a big black S-shaped line, more obvious on the left than the right. But those are the fluid cavities of the brain, which still contain fluid. In the left-hand picture when the brain is swollen, they've become very much compressed although there's still a little bit of space at the back. And that corresponds with what we saw on the brain slices where the ventricles were still open in the posterior slices of the brain, so it corresponds quite nicely with what we saw.

Q. So if you're describing this and you describe the swelling as being more severe in the posterior fossa, you as a pathologist, as a neuropathologist, do you make any conclusions from that or do you simply describe that?

A. We do wonder why this happens because we want to know why a process that may have been generalised -- for example, if there were lack of oxygen, that should affect all of the brain, and we probably make some explanation such as the posterior fossa is a smaller cavity. If there's swelling there, it's more easily compressed, and it may well be that swelling there compresses the local blood vessels, so then there's no blood supply to the brain. It swells again because it's lacking oxygen and blood supply. And it may be that

swelling becomes more pronounced in the early stages there and then later on, the rest of the brain swells, it's got a little bit more space in the front part of the brain. So we may try and make some kind of suggestion like that as to why the distribution of swelling may not be even.

We also know that brain swelling takes up to 72 hours to reach its maximum, so we're looking at a brain some 24 hours -- or, here, we're looking at a brain only a few hours after an event may have taken place. So it may not be for another couple of days until the whole brain would be completely swollen. We're looking at the early developmental stages of the brain swelling.

Q. So do you record it anyway even if you're not entirely sure what its significance is?

A. I think that most pathologists wouldn't notice, wouldn't record it at all, because what would be the critical feature is that we can see that the hindbrain has swollen and has caused coning, and that's a cause of death. That is what's clinically important and clinically relevant. How much of the rest of the brain is involved is not a matter of clinical relevance and is really of academic interest.

Q. If the changes that you've described lead to an

examination at autopsy and then subsequently on fixation, which may not entirely represent the look of the brain at the time of the insult or the event, and if you are aware of the fact that there are CT scans, how important is it for the pathologist to look at the CT scans?

A. Well, I have a particular interest in doing this. I've always felt it's really quite important that neuropathologists and neuroradiologists work together and compare their findings because we need to inform each other, and I think it's terribly important that we look at the best representation we have closest to the event. That may be the brain scan, it may be the clinical findings in a patient whose clinical history shows various dramatic changes which would help us to understand the pathology. But of course, the brain scan is objective and I think it's really important in understanding the final pathology.

Q. Is it possible that if you have the pathologist carrying it out who's not a neuropathologist, they may not appreciate the significance of some of these things that you're saying you'd be looking for and you might be describing and you might be speculating over?

A. Yes, I think -- well, I think it's always important. I think a general pathologist might not think quite so

carefully about the individual processes that are going on within a brain during ventilation and during swelling and would perhaps just go for the clinical relevance of the cause of death and not appreciate how important it is to look at the progress of the processes which have led to death.

Q. And would that be a reason for a pathologist to think, "Maybe I will bring in a neuropathologist here, who might see something that I don't"?

A. I think there's a far more simple reason why a neuropathologist might be brought in in that we have brain swelling unexplained in a child after an operation. Those are all things that should raise red flags that we might need to look very carefully at this case.

Q. When you say "look very carefully at this case", in relation to involving a neuropathologist, I think you may have heard some of Dr Mirakhur's evidence where she was talking about the range of ways in which neuropathologists could be brought in, ranging really from something quite formal, whether initiated by the pathologist or maybe the coroner, to walking across and showing some slides and asking a colleague, "What do you think of that?". Would you accept that there is that range?

A. Oh absolutely, yes.
Q. In a case like this, though, where you say that there's a very much more straightforward reason why you'd bring in a neuropathologist because the insult or the event is taken to have occurred in the brain, does that indicate whether you're more one side of the spectrum than another in terms of formal referrals or walking across and showing some slides?
THE CHAIRMAN: In 1995.
MS ANYADIKE-DANES: In 1995, sorry.
A. Yes, I think in 1995 things were a lot less formal. If you had an absolutely clear-cut cause of death somewhere else, you had a patient who collapses in the street and you find a cardiac arrest and cardiac infarct and you can be sure that's the cause of death, but the brain's a bit swollen, you might say, "Well, the patient was breathing for 30 minutes before somebody resuscitated or took them to hospital". You might well say there's no point in doing a neuropathological autopsy here because we've got a very good explanation. So I think that where it's not that simple and the primary pathology may be in the brain, that's where one would expect a more formal request for assistance.
Q. Two things from that. One, in your view where does Adam's case lie?

A. It seems to me that the primary pathology identified was brain swelling, so it lies very much in the case that the pathology's in the brain and that needs to be looked at rather carefully.
Q. When you say "more formal", in 1995 -- because you have just said how things are different now, but in 1995 what form would that more formal involvement have taken?
A. I think the formal request. As Dr Mirakhur has already expressed, it should be a formal request to come and be involved either at the start, or if the pathologist doing the autopsy did the autopsy, took the brain out and then, when the brain was fixed, started looking and thinking, "We don't have another explanation here", that point would have been a good time to ask for the neuropathologist to come and assist with the examination of the fixed brain.
Q. But if the child, as Adam was, was already thought by his clinicians to have hyponatraemia, irrespective of the form of hyponatraemia, and to have suffered a fluid overload, then does that suggest whether it's at the start or after fixation that you bring in the neuropathologist?
A. Again, a pathologist may well have thought, in 1995, "Well, we know the cause of the brain swelling, this is fairly straightforward", and for that reason may have

thought it wasn't important to get a neuropathologist on board. But again, I think the overriding conditions here of a child dying after surgery and the hyponatraemia may well have implicated some form of therapy relating -- iatrogenic cause of the oedema. I think then that, for her own protection, she might want to have another opinion from the start.

THE CHAIRMAN: And it does appear, on Dr Armour's evidence, that she did in some way engage with Dr Mirakhur. There doesn't appear to be a written record of that. The query is therefore how informal it was; isn't that right?

A. Yes. And that's -- I think again for ... She exposes herself in a way to taking on responsibility without having another signed report from a consultant colleague.

THE CHAIRMAN: So it's not as if Dr Armour, save in the Professor Kirkham approach, it's not as if Dr Armour didn't get fundamentally the cause of death right, as appears from others, nor is it a case where she doesn't appear to have recognised the relevance of neuropathology because she has, to some extent, involved a neuropathologist. So to the extent there's potentially any criticism of her, it's about the way in which she did that and how formally she did that?

A. I think that's right, and I think Dr Mirakhur might well have felt rather concerned that her name was used without her being given the opportunity to write her own report, so her name was used in such a way that she could answer to that. In the way she's left at the moment, she's said to have contributed, but she has no recollection and there's no signed document to show that she was involved.

MS ANYADIKE-DANES: But if we take the substantive point, though, it would appear that Dr Armour did think that the involvement at whatever level of a neuropathologist was appropriate, leaving aside how she went about it, so she formed that view. She then reached a view in her report on autopsy, which is a view, I think, you broadly share, leaving aside the issue to do with the ligature, but if one focuses on the cerebral oedema, which is a view you broadly share; wouldn't that be right?

A. That's correct, yes.

Q. So she was able to do that, form that view, that was a view shared by the coroner's expert and many other experts who have looked at the case. If one was looking at it from the way in which these systems and processes and procedures operate, what then is the significance or the value of saying that perhaps it would be good practice to involve, in a formal way,

a neuropathologist. What is the benefit of doing that?
A. Well, I think there might be considerable repercussions from a case such as this in that there may be questions about how the surgery went, how the fluid was managed, and it's quite a lot of responsibility for a pathologist who's not, in fact, a consultant to answer all of the questions in that situation. So I think that it would be advisable that she seeks the advice of somebody who may be able to provide, perhaps, some more robust report. I know she's got it right insofar as she's done the neuropathology, she seems to have made the correct observations and they are consistent with the history. But I would just think it's good practice to have the support of consultant colleagues if you're dealing with a case that may well lead to a lot of questions in the future.
Q. And is there always a concern that the neuropathologist, with their experience and expertise, might actually see something that proves to be relevant?
A. Absolutely, yes.
MS ANYADIKE-DANES: I wanted, Mr Chairman, to go on to deal with the issue of the ligature and then I was going to take Dr Squier through the report on autopsy. In the light of what you said earlier, we have her report, so I wasn't going to take her to all of her report. But

I was going to have her work through the report on autopsy, and that's how I was going to deal with it. I'm looking at the time.

THE CHAIRMAN: I think we do need to break now for lunch. I think Dr Squier's covered many of the main issues she has come to Banbridge for and it would be helpful therefore, over lunch, if there was some discussion about how much more detail her remaining evidence needs to be presented in.

MS ANYADIKE-DANES: Yes, Mr Chairman. I can envisage there is an area of detail around the ligature point that we may need to deal with.

THE CHAIRMAN: In light of the evidence which we heard in May about the ligature, it might be that that evidence isn't necessarily prolonged.

MS ANYADIKE-DANES: It might be, sir. Thank you very much.

THE CHAIRMAN: We'll start at 2.15.

(1.08 pm)

(The Short Adjournment)

(2.15 pm)

(Delay in proceedings)

(2.22 pm)

MS ANYADIKE-DANES: Dr Squier, just before we broke for lunch, I had asked you a question about brain-only post-mortems. I was asked if I might ask you this

follow-up and that is: when you had looked at the guidance that was thought to have been current at the time of 1995, if there is to be a brain-only post-mortem, then does it matter whether that's being carried out by a consultant or somebody who's not a consultant, even an experienced person?

A. It depends a bit on how that person's status is viewed. If you are not a consultant, but you have considerable experience, you may well be perfectly competent to do the brain removal and to note anything that's important in the rest of the body without opening it, but general observations, and of the cranial cavity alone. A more junior person who's not a consultant would probably want a consultant just to come and cast an eye over things to confirm that they had not missed anything at the time of brain removal.

Q. So how significant is it to have a consultant carry out a post-mortem at all, whether it's going to be a brain-only one or whether it's a full autopsy?

A. A consultant is the person who usually will take responsibility. A consultant is somebody who is fully qualified and regarded as experienced and enabled to practice alone and to offer an opinion. Anybody who's not a consultant must be regarded in some ways as a trainee and, therefore, may require the assistance of

a consultant, even if it's simply to provide a signature to check that the trainee has carried out the procedures appropriately and come to the correct conclusions.

Q. So when I asked you that before and said, if it's going to be a brain-only post-mortem, does it make any difference whether it's carried out by a consultant or not, it may have been I was a bit loose in my language. They may be two different things: who carries it out and who takes responsibility for it. Are they two different things?

A. They certainly are. For example, if we're doing a -- we're doing a huge research project in Oxford on Alzheimer's disease and the technicians will remove the brains and keep them because we're only interested in looking at the brain for Alzheimer's disease, so a technician is perfectly capable of taking out a brain and keeping it and all the information we want will be in the brain. If it's a situation such as this, where we're not sure of the pathology, then obviously a doctor, a qualified person, will take the brain out. If it's somebody who has considerable experience and has done a lot of autopsies, then that person might be regarded as being perfectly appropriately qualified to remove the brain alone and note other relevant factors and then go and examine the brain at a later date.

Q. In those circumstances, should or would -- we're talking about 1995 here -- the report be signed off by that person's consultant?

A. I think in 1995 -- I think, in most places, one would expect a consultant to put an underlying signature underneath the final report, even then. But I think practices probably varied considerably between different places. I don't think where I am in Oxford we would ever have allowed a non-consultant to sign anything out, even in 1995, without a consultant's confirmatory signature.

THE CHAIRMAN: You know that Professor Lucas has said in his report that Dr Armour did have the necessary experience to do this report and, on the central issues, I think you shared Professor Lucas' views that she did it well to the extent she identified the correct cause of death, she got the central issue right.

A. That's absolutely right, yes.

THE CHAIRMAN: There is some scope for criticism on areas perhaps around the edges, but on the central issue, she got it right. Would that support the notion that she did have the experience which was necessary to do this, which turned out to be a slightly unusual autopsy?

A. I think that's probably right because I was asked a general question. I think specifically in this case,

Dr Armour was rather unusual in that she had passed her final exams in the College of Pathology some four years earlier, so she was certainly qualified on paper and she had four years' experience. So that's the sort of person who would normally have already gone to a consultant post. So in terms of her experience, I'm sure she was well qualified to do it.

THE CHAIRMAN: So is the fact that she wasn't a consultant, is that likely in this case to be more to do with the lack of vacancies for a consultant's post rather than that she was not qualified to be one? Because in fact she was qualified to be one.

A. She was certainly qualified in terms of experience and examination. It may have been just because she wanted to stay for specific training that she was being offered or lack of vacancies. We don't know.

THE CHAIRMAN: Yes. I'm just a bit wary about looking back 16 or 17 years ago to Dr Armour in 2002 being overly or unfairly critical of somebody who seems to have got the central question right.

A. I think that's right. I think, in the specifics of this case, she was well qualified and, in general terms, she wouldn't have been a senior registrar at this stage, she would already have got a consultant post because most people do that within six months of getting their final

exam.

THE CHAIRMAN: Thank you.

MS ANYADIKE-DANES: So if you're in the position of Dr Armour, you shouldn't therefore need a consultant to sign your report in the way that you've just indicated?

A. I think that's probably right, although I would always just ... My own personal view would be that just simply to cover her, that anybody who's not got a consultant appointment should have somebody who's perhaps got slightly broader shoulders and is willing to take any responsibility. But I think she has shown she was certainly capable and experienced to do this on her own.

Q. Thank you. I wonder if we can go through Dr Armour's report on autopsy, simply to pick out those elements of it which you haven't already addressed, either by reference to the photographs or the diagrams or the comments or the answers that you have given to the Chairman. Dr Armour's report is to be found at 011-010-034.

If we go to the next page, 035, let's start with the history. This is one of those essential elements that one saw in the 1993 guidance. The chairman has already alluded to the fact that Professor Lucas has said there may be quite a bit of discussion. This is a different section. This is simply to try and set out the clinical

history, and I had been asking you before where that would come from. You said that that would come from a number of places: medical notes and records, the clinicians and so forth.

Who is taking responsibility for this? Is the pathologist entitled to record what the clinicians say, subject to anything that they point to in the medical notes and records, or is the pathologist expected to go through what might be quite lengthy medical notes and records and pull out for himself the history?

A. Usually, it would be the latter. The pathologist would go through the records and take the appropriate notes, often having consulted the clinicians so they would know which were the specific points which were relevant to the death of the patient.

Q. For example, I'm not asking you to say where this would come from, but if one looks at the penultimate line on the second paragraph where it says:

"Peritoneal dialysis was performed as usual."

It says what the fluid volume was, what the solution was, and what the cycles were. Is that the kind of technical information that you're saying that the pathologist goes to the medical notes and records and gets for him or herself?

A. Yes.

Q. And what is the pathologist expecting to receive? The full medical notes and records or the most recent?

A. Usually one would be presented with all of them and that's where it's helpful to talk to the clinician and say, "I've got 10 bundles of papers here. Which were the relevant points that are important as far as the patient's final illness and the cause of death are concerned?". So we don't need to go into the past history of rheumatoid arthritis or heart disease many years ago; we'll deal only with those matters that are relevant. And that will very much help the pathology because wading through 10 files of notes of things that aren't relevant would be a waste of time and would be unwieldy in terms of writing a report. So that's where you can get, certainly, guidance from the clinicians, but then a pathologist might choose to do it on their own, simply to go through the most recent records and work from that.

Q. If we go to the bottom of the page -- well, the penultimate line from the bottom, it talks about:

"An emergency CT scan at 1.15 revealed gross cerebral oedema."

There would be a radiologist's report of the CT scan and any X-rays, and that sort of thing. How much is the pathologist expected to go behind that? Is the

pathologist entitled just to take what the radiologist's report says or is the pathologist expected to look at the CT scan and form a view themselves?

A. I think the pathologist is perfectly entitled to use the report.

Q. Thank you.

THE CHAIRMAN: Presumably, doctor, on the basis that she uses the report and can rely on that unless there's something contradictory or inconsistent which should lead her to continue her enquiries elsewhere?

A. Yes, it may be that when she has done the autopsy, she will think it doesn't fit with that finding and she will go back and then check the records or check the scans.

MS ANYADIKE-DANES: So to a large extent, when one's dealing with a death that happened either during surgery or just after surgery, the records that are kept become really quite important because if the pathologist is going to try and form a view themselves, looking at the records, their view is as good as the records can guide them to it, if I can put it that way. For example, if one looks at that third paragraph, about halfway down, it talks about there being an increase in blood loss calculated to be approximately 1,200 ml at the end of the procedure. If that's what the records say, even though it hasn't maybe been entirely accurately collected

because there is other fluid in there -- it's not all blood and so on, that's -- subject, as the chairman said, to somebody saying something to the contrary -- the information that the pathologist works from?

A. Oh yes.

Q. So that becomes quite important, how accurate all that is?

A. Absolutely. And it's only sometimes when you, afterwards, go and talk to those who were present and they say, "So much was going on at that time we probably just made a guess and it may be inaccurate". But the pathologist at the time would be, I think, perfectly correct in just looking at the records as they are and taking those at face value before doing the autopsy.

Q. Then if we go over the page to 036, there's reference to a chest X-ray revealing pulmonary oedema. In fact, we know there were two chest X-rays. One was taken at 1.20, which is very shortly after the surgery, and that indicated mild pulmonary oedema. And another taken at 9.30, which indicated an increase in pulmonary oedema in both lungs.

Now, if there's an issue about oedema at all, which there seems to be in this case, although not pulmonary oedema, how specific or detailed does the pathologist have to be? Does she have to go away and say, "Well,

just let me check how many X-rays there were", or if only one was referred to in the notes, "I will go with the one and how that's described"?

A. I think she would take it on face value and that would be perfectly appropriate.

Q. The CVP catheter tip in the neck vessel. We'll come on to this in a minute, the significance of it. Should the body come down to the mortuary with its line still there if there's going to be an autopsy?

A. That is the preferred way so the pathologist can see exactly what was in place, what was still in place at the time of death and what might have been there some days before, I think --

Q. Even in 1995?

A. I would have thought so, yes.

Q. And that is of assistance to the pathologist if they remain in situ?

A. Yes. If there's a question, say, if a catheter was working or not, for example, you would want to see that it was in the right place and was clear.

Q. If we go over the page to 37, this is the external examination. Dr Armour has said that the technician weighed and measured the body. That would be normal, wouldn't it?

A. Yes.

Q. You wouldn't expect the pathologist to be doing that?
A. No.
Q. But whose responsibility is it to describe the appearance of the body?
A. The pathologist's.
Q. So if the body is bloated?
A. The pathologist should describe that.
Q. Can we pull up -- this is going to be a picture of Adam -- 300-080-155? Is the description of Adam like that something that, in your view, should have been included in the report?
A. If she didn't know what he looked like before, she might just have thought this was not bloating, but his actual body shape. She might have thought he was -- there, on that picture, he could look as if he were obese.
Q. Would you ask if what you're dealing with is fluid overload?
A. I think that's a very difficult question. I think she might be -- she might just simply assume that this was his normal appearance.
Q. Thank you.
MR BOYLE: Sir, I don't think there's any suggestion in any of the evidence from any of the clinicians that anybody brought to the attention of Dr Armour, who of course never met Adam, what his appearance had changed from the

preoperative state.

MS ANYADIKE-DANES: I hope I haven't suggested that.

So then if we carry on with the external examination, as you look down, I think I asked you before about photographs and I think you thought that there might well be photographs or diagrams.

A. Yes.

Q. Is there any other description that you feel ought to have been made there that you don't see in that external examination?

A. I think this looks as if it's a fairly comprehensive description. As I said before, anything -- if there are a lot of marks of medical intervention, needle puncture marks and the like and so on, it's always helpful to have those in a diagrammatic form.

Q. If one looks at the chest and abdomen there, does that indicate whether it would have been helpful to have had a diagram or photograph of that?

A. It's helpful, but if it's well described and if it's nothing that is perhaps regarded as significant, we're not looking to try and distinguish between needle puncture sites and bruises in the case of an assault or something. We're dealing with a child who's been through very extensive surgery and would be expected to have a lot of lines and so on. So she may well have

thought there's no reason to do photographs or even a diagram with this degree of description. She seems to have given a fairly extensive description of what was there.

Q. The purpose is so that people understand what's going on and if it's described or photographed or rendered into a diagram, so long as people understand what's going on, that's the purpose of that section?

A. Yes.

Q. So 38, under the brain, it says:

"To be described after fixation."

Would you have expected any description other than that?

A. Yes, I would. I would first of all have expected the brain to be weighed and for it to have been described, even in a brief form, at this stage. As I think I mentioned earlier, when the brain is very swollen, it can be very difficult to handle and turning it over and looking at it can cause more damage to the brain. So I think it should be described and it certainly should be weighed at this stage.

Q. Well, we know that it was weighed, simply the weight hasn't been recorded here. In fact, if we go to the notes that Dr Armour made as she carried out her examination, if you will just give me one moment.

(Pause).

MR BOYLE: Witness statement 012/2, page 25.

MS ANYADIKE-DANES: Thank you. Yes. In fact, there's a long list of her notes before this comes up and you can see there that has the brain weight, first, as "1,302", and then it is corrected to "1,320".

A. Yes.

Q. Not necessarily that weight, but the weight, as you see through the list of the contents on the internal examination, you had expected to find the weight next to it?

A. Yes.

Q. And a description?

A. Yes.

Q. And if we go down and look under the neck and chest, you see the heart is 120 grams. When a weight is given, if the weight is outside what might be considered to be normal parameters, would it be part of this section to say that or to indicate that in any way?

A. It should certainly be mentioned somewhere. Some people now put a little table in with the normal weights next to each of the organ weights. Others would perhaps put it when they write their final report and this report at this stage would just be the report of the autopsy itself, where you might simply note what is there and

then discuss the relevance of those findings when you put together the final report where you have all the histology and microscopy and so on.

Q. Professor Lucas has discussed this seems rather enlarged or a heavy heart for a child of that age, and I think in his report he says in his unit they would probably have retained that and not let it go off for transplantation. But just so that I'm understanding you, if that were the case -- and I'm not asking you to express a view as to whether it is a heavy or large heart -- but if that were a view, then would you expect to see that recorded somewhere even if ultimately it was going to be sent off for the valves to be used for transplant?

A. I think it should be recorded somewhere, whether it's in the initial examination or the final -- initial report or the final report, I think, may be variable.

Q. Sorry, if I just mention something about the brain. Do you describe how much has come with it and what else you've taken? Is that part of what you describe?

A. You would certainly describe if you have taken spinal cord or nerve or muscle or part of the dura as well. That should be part of your initial report.

Q. Then if we go down through the abdomen, it says the liver was a little congested. Is that something that would require a little expansion so that anybody knew

what that was or its potential significance?

A. I think at this stage this is fine because one would expect to have a histological report and then all of this could be put into context. At the moment, looking with the naked eye, you don't have all the information, so probably a brief description --

Q. Just visually describing and recording weights and measurements, essentially?

A. Yes.

Q. Thank you. If one looks at the native kidneys, would you have expected to see a weight there?

A. Yes, I would.

Q. And how important is that?

A. I think it's important. It's just a routine. It's just what we do and at the time we do it so we can be sure that organs have developed normally, have achieved their correct weight and whether or not they have then lost weight afterwards due to some disease process. And it can just alert us to subtle changes, so yes, I think the kidneys should have been weighed and particularly in a little boy like this who we know had renal problems.

Q. Over the page, there's the internal examination of the neck and this is, I think, an area that you have commented upon to a significant extent, I think, in your reports. But just so we understand what you're saying

about it, it says here:

"There was no evidence of congestion or obstruction of the major blood vessels or the carotid arteries and jugular veins. There's no evidence of superior vena cava obstruction. The carotid arteries were normal. There was a suture in situ on the left side of the neck at the junction of the internal jugular vein and the subclavian vein."

And I think you have said that that's internally inconsistent, that paragraph.

A. I think, at this point, it isn't internally inconsistent because we don't know where that suture was. It becomes inconsistent if we say that the suture was causing obstruction of a vessel because this states quite clearly that the vessels that were examined, there was no superior vena cava obstruction, the arteries were normal and there was no congestion or obstruction of major blood vessels or the carotid arteries or jugular veins. So the vessels have been described as normal and then it says there was a suture at the junction of the internal jugular vein and the subclavian vein. Where that suture was in relation to that junction, we don't know if it was adjacent to soft tissues or if it was in contact with or obstructing the vessel call. We simply can't tell from this description.

Q. But at the moment this is just describing. It's not ascribing any significance to that, just describing?
A. That's correct.
Q. If something like that had been identified, as Dr Armour says it was, is that the sort of thing that's worthy of a photograph?
A. In the normal course of events, if we know that this child has had lines put into the neck veins -- probably not terribly remarkable because it happens, it's a common practice, and you would expect to see the residual effects. But if it is something you regard as important as part of the cause of the brain swelling, then I think it would be helpful to know exactly where it was, to have a better description and probably a photograph, and if there were a question as to whether it was recent or old, I would have thought it would be helpful to take a sample to look at under the microscope where you might get an idea of how long the reactive process to that suture had been going on for.
Q. If at this stage what's going on is just sort of observing and describing, if I can put it that way, the inquiry has heard evidence that the body -- and I think you have said so in your reports -- responds to those sort of foreign objects being there and there's a reaction to that and that is a reaction that can be

detected.

A. Yes.

Q. So if there were that sort of reaction, is that part of what you would record in your observing and describing section?

A. It would have been helpful because just to say there was a suture, we don't know what that means. We don't know if it was just a little piece of plastic material from which a suture is made or if it was a suture with the normal tissue reaction around it, where you might see a matted piece of tissue with just tiny ends of the suture, which allow you to recognise it. So it's not a very clear description and it certainly doesn't help us to understand the role that suture may have played in any obstruction of blood flow.

Q. Is that one of the purposes of a pathologist recording that because this is is all going to be part of the story as to what happened and how it happened?

A. Yes, of course. It requires the pathologist thinking ahead. At the time, she's just got this brief interval in the post-mortem room to make all of these decisions. She may well have thought: that's what you get when you put lines in and it's irrelevant because we have a different cause of death. But looking back on it, she then wrote in her final analysis of the case that she

thought that suture was relevant, in which case we want to know lots more about it. And it's just perhaps an unhappy accident that she didn't look at it more closely at the time when the material was available.

Q. Yes. Then we go to the description of the organs after -- we'll come back to that bit because in the bit of the report that deals with her conclusions, if I can put it that way ... Then there's a description of the organs after fixation. And there you have a weight of the brain of 1,680 grams. I think you have said that that's heavy.

A. Yes.

Q. If you had already weighed the brain and put in your notes "1,320", and then on fixation you have 1,680, at that stage do you ask yourself whether those two things are consistent with what you're seeing, if I can put it that way?

A. Yes. We know that the brain weight changes from the time it's fresh to the time it's fixed and it usually acquires 10 to 12 per cent of its weight. That would have been quite obvious that 300 plus grams is a very large percentage of the brain weight and one would be wondering why that happened. It is more than one would expect from just fixation, so one would be wondering if somebody's made a mistake in the weighing at some point.

We know that different sets of scales can be different and so these weights are not terribly accurate.

Q. Mm-hm. Dr Mirakhur had given her evidence to say the 1,320 would be towards the upper limits of what was perhaps a normal band; would you accept that?

A. Yes.

Q. But this is definitely not normal, 1,680?

A. Yes.

Q. Then the second paragraph under that external examination is the description of what she sees. In the light of your examination of the sections, is there anything that you might have added to that or do you think that's a fair representation of what can be seen?

A. I think that's a fair representation of the brain cut, yes.

Q. If we look at where the blocks were taken from, you had previously said that -- well, the guidance tells you about the dura. I take it there's nothing from the dura there?

A. No.

Q. And you had also said not only would you want something from the dura, but the venous sinuses would be relevant, you thought. What's the significance of her not having taken blocks from the dura, so far as you can ascertain?

A. In a case such as this, I think it's probably not

terribly significant, but I would still stress that she should certainly have looked at the dural sinuses because that's very important, even though it's not in the guidance.

Q. Do you mean in a case such as this because, as it turned out, it wasn't relevant?

A. We're not looking for any pathology that's related to the dura, we're not looking for trauma or dural bleeding.

THE CHAIRMAN: Is this really an example of the guidelines, in your view, not really being good enough? This is your reference earlier this morning to you being very surprised that the sinuses aren't referred to.

A. I'm very surprised, yes. I think I'm surprised because, in some ways, they've missed what is obviously a very important examination, but they've suggested that we should do things that I would virtually never do. So they are a little bit patchy and I suppose that reflects being written by somebody who has a specific way of doing things.

THE CHAIRMAN: Right.

MS ANYADIKE-DANES: Then if we go over the page to 040, "On microscopy", just before we do that, we see the lungs and they are described there, but there is no weight for the lungs. Would you have expected the weight of the

lungs to have been given?

A. It is usual, yes, particularly as, I think, there was an X-ray saying there was oedema. So one would expect to weigh them to see how much fluid was in them.

Q. In fairness to Dr Armour, she had weighed them or at least she had had them weighed, they're just not in the report, which I think she says was a typographical error. But you would expect to see the weight of them in the report?

A. Yes.

Q. If we go over the page to 040, we see that with the liver there's:

"No evidence of cyst formation within the portal tract. There were scattered foci of clear cell change."

Would you have expected anything further to have been said to get some guidance of the significance, if anything, of that?

A. Not an organ I look at very often. That's something I can't comment on.

Q. That's all right. Sorry. If we go further down, it says:

"The above slides were seen by Professor Berry, the consultant paediatric pathologist."

So he saw those. And then there's the brain and there's a description of the brain:

"Massive cerebral oedema of the cortex and white matter. There was no evidence of terminal hypoxia. There was no evidence of myelinolysis. Spinal cord, no specific pathological features were noted."

Then it says, in a rather similar way:

"Brain, spinal cord and histological slides were seen by Dr Mirakhur, consultant neuropathologist."

Dr Mirakhur has given her evidence that if her name was going to be in it, she'd have expected to have known about it and then she could have taken whatever steps she wanted to to see whatever she wanted to. How do you respond to that comment of hers?

A. I think she's perfectly correct. I think she could have been quite angry that she had been quoted without having an opportunity to have her own input into it.

Q. Then if we go to the commentary, and this is, I think, the part of the report that Professor Lucas says is overlong. But is a that not something that's a matter of either the personal style of the pathologist or a response to what the pathologist thinks an individual coroner likes to see?

A. I think both of those. I think this is actually a very well worked commentary that Dr Armour has looked at the clinical story in some detail and she has done her best to make a detailed account of the factors which may have

been relevant in the death and how they fit in with what she has seen. So I would have actually not agreed with Professor Lucas on this and I think she's -- it's a very appropriate way of writing an autopsy report. And if the coroner -- the coroner is the person who will decide whether that's appropriate or not for his particular practice. And coroners vary tremendously.

Q. Yes. Then if we go into the brain -- this is where I would like to ask you a little bit about the brain weight. The brain weight appears in a number of different places. It appears and is 1,320 grams in a letter to Professor Berry, which is his referral letter, which is 011-029-152. There we are:

"On post-mortem, I found gross cerebral oedema."

Are you able to tell from that -- when that letter's going out, that must be before fixation, if one looks at the first page.

THE CHAIRMAN: The continuation of that line --

MS ANYADIKE-DANES: Exactly. Sorry:

"... fixing and a neuropathological opinion will be requested."

So it seems clear from this that Dr Armour did, as the chairman said this morning, identify the fact that neuropathological involvement was appropriate and she said she was seeking one.

A. Yes.
Q. And then if we go back to that witness statement, 012/2, page 25 --
THE CHAIRMAN: Sorry, Ms Anyadike-Danes, who is that letter to?
MS ANYADIKE-DANES: I thought I had introduced that, sorry.
THE CHAIRMAN: Just remind me.
MS ANYADIKE-DANES: It goes to Professor Berry. This is his letter of instruction with the acceptance of the coroner that he should be asked and he --
THE CHAIRMAN: Okay.
MS ANYADIKE-DANES: She cites everything that she's providing to him. That is all perfectly proper, I take it, all the detail that she's providing to him?
A. Yes, indeed.
Q. Then she gives him a little summary. And when you had talked before about what you might expect in terms of information given to you by the coroner, is it this sort of summary that you'd have expected if you were the pathologist doing it to receive?
A. This is very helpful because it's just a brief outline of the story so that Professor Berry can look at that and see whether he wants to start looking at the notes in detail for himself. But that at least sets the scene and then he can look and see whether he can find some

consistencies with the pathology and that story.

Q. Exactly. Then if we go -- well, I won't take you to it in detail because you've already seen it, which is where it's referred to in her notes. If we just look at the notes: 012/2 at page 25. Can we go to the previous page, 24? This would appear to be a draft with all the relevant headings for her final report.

A. Yes.

Q. And then we see there that she has, under "The lungs", included the weight.

A. Yes.

Q. And we also see that, under "The heart", she has the weight and there was a place to put further information, if I can put it that way, about the heart, but that's just not included.

A. Yes.

THE CHAIRMAN: I'm sorry, what's the point of this?

MS ANYADIKE-DANES: Because she ...

THE CHAIRMAN: I'm a bit lost on the detail in which we're going into the notes and the report.

MS ANYADIKE-DANES: Just the way it was done, Mr Chairman, but we can move on.

THE CHAIRMAN: Yes.

MS ANYADIKE-DANES: Then if we go over the page, 041, there is quite a lengthy section which recites the information

on the CVP and the rise in the CVP and so forth. Then if we go to the last large paragraph before those smaller ones, the penultimate one and the final one, we see:

"Another factor to be considered in this case is cerebral perfusion."

Just so I can be clear, what is cerebral perfusion?

A. It's the blood flow through the brain.

Q. It says:

"The autopsy revealed ligation of the left internal jugular vein. The catheter tip of the CVP was situated on the right side. This would mean that the cerebral perfusion would be less than that in a normal child. This would exacerbate the effects of the cerebral oedema and should also be considered as a factor in the cause of death and therefore the most likely explanation is that cerebral oedema followed a period of hyponatraemia and was compounded by impaired cerebral perfusion."

This would appear to come from two elements. One is the fact that the left internal jugular vein is ligated and the other is that the CVP catheter is on the right side. So there's a significance now to the description that was given of the suture in the earlier part of the report. In order to reach this conclusion, what do you

think is the investigation that would have to have been carried out?

A. Well, I think this is where we need to know if that vessel actually was occluded by a ligation and how long it had been there because this would be a very important fact in trying to understand whether there was a contribution to brain swelling. I would perhaps say that I think the terminology's a little bit confusing here because "perfusion" means the blood flowing through the brain and we're talking about obstruction of vessels draining blood from the brain. So in fact, they're less important. Blood can get in and that's fine, so the perfusion can go on quite well. What we're considering here is if obstructing outflow from the brain will cause back pressure in the tissues of the brain and lead to further swelling. So I think we should be clear that we're talking about the outflow side of the brain here.

Q. On the outflow side, which causes or contributes the soonest with the greater effect to this brain swelling? Is it the outflow or the inflow constriction?

A. Both will contribute. Inflow constriction will cause rapid cell death and swelling consequent upon that. Outflow obstruction will probably cause swelling before it causes cell death because it's going to allow fluid to accumulate in a tissue which has its oxygen supply,

but it will gradually be cut off as the fluid accumulates. So I think that we're going to see two different effects and the swelling per se would probably be greater if you obstruct the outflow rather than the inflow.

Q. And for it to have that effect, when in your view would the suture have had to have been inserted?

A. Well, we do know that the outflow system of the brain, of any organ of the body, the venous system is very much more plastic than the arterial system. Veins are good at getting bigger, smaller, accommodating increased flow. If their flow is obstructed, they will create new channels to get around obstructions. So in order to have a dramatic effect on the brain, obstruction should be severe, virtually complete and rapid because compensation will take place over time.

Q. And how long does it take to develop compensating pathways?

A. Oh, probably a week or so will allow vessels to grow around an obstruction.

Q. And you would see that?

A. You would see that under the microscope, but also because the brain has many venous channels, it's quite easy for quite rapid redistribution of blood to occur. So if a vein is obstructed, the brain will, wherever it

can, send blood out through another pathway to protect the tissues.

Q. And where would you be seeing that effect?

A. Well, if it's happened immediately before autopsy, you probably wouldn't see any effect at all or you might see some rather congested vessels. If it's a few days old, the vessels would tend to be rather distorted and showing that they had lost their normal straight configuration because they're getting larger to accommodate more blood --

Q. Sorry, can I just pause you there? When you said that if it happened pretty much immediately, you might not see anything at all rather than congestion, but that's not what Dr Armour describes. When she describes the internal examination of the neck, she doesn't have any congestion.

A. No.

Q. So she's not describing that?

A. No.

Q. So if it's not like that, happening immediately, then what are you seeing?

A. If it were obstructed for a period of time, one would expect to see that other vessels had enlarged to take increased flow, which wasn't able to go through the obstructed vessel.

Q. And even if you hadn't got to that stage of concluding that, is that something, when you're in your observing and describing stage, you would have been able to see?
A. One would hope to, yes.
Q. And if the suture had been put more than a few weeks prior to the surgery -- let's say months -- what would be evident when you were looking at the internal structures of the neck?
A. The vessel would look abnormal. It would look narrowed, it would look scarred, fibrosed. There might be congestion of vessels above it or new vessels growing around it and an abnormal sinuous pattern of the congested vessels above it.
Q. And that would be evident?
A. That should be evident, yes.
Q. What I think Dr Armour says in her evidence is that she was told that -- well, I should say that we had quite a bit of evidence during the earlier clinical phase of this hearing from surgeons and anaesthetists, particularly Dr McCallion, who gave evidence as to when -- and I think you may have seen his transcript and his witness statement -- Broviac lines went in, when they went out, when X-rays were taken and all of that in his evidence was to show that the Broviac line that was inserted in 1992 -- there was an X-ray taken that showed

that this particular area, where Dr Armour thinks there was constriction, was still patent, the left internal jugular vein, and then there was evidence to say that the Broviac line had been removed in February of 1995. And that procedure had taken about 20 minutes to do. And in his view, that had not involved doing anything that would involve constriction to this particular area that is described by Dr Armour. So that was his evidence.

Dr Armour has said that she was told that that suture was put in when the line was removed, and so if that's February 1995, and let us say that that is correct, that a suture was put in in February 1995, what do you think would be evident or could be seen at autopsy in November 1995?

A. I would have thought there would probably still be some reactive process around the suture, whether it was in the vessel wall or adjacent to the vessel wall. One would see some thickened fibrous tissue around the suture as part of the breaking down of the suture material, which is a normal process.

Q. I should say the evidence that Dr McCallion gave was that, in his view, no suture was put in at that time. His evidence was on, just for the record, 11 May 2012. I think it starts at page 184, line 8. Essentially,

what's saying is that the time that it would have taken -- firstly, I think he says that he doesn't understand why you would do that. But in any event, the time that it would have taken to insert that, there simply wasn't that amount of time recorded in the papers for that to happen. So that's his evidence. But anyway, there is a difference in view between them.

What I'm simply trying to ascertain from you as a neuropathologist looking at that area on autopsy, if the suture had gone in as Dr Armour was told, says she was told it did, are you saying that there would still be something that you could see to indicate that a suture had been there by autopsy in November 1995?

A. I would have thought that in nine months there may still have been some fibrous healing going on, yes.

Q. Enough to be able to describe it as opposed to just actually happening?

A. You would need to look for it carefully. It wouldn't be a large mass and it would be easily overlooked if it were not actually in the vessel, but examining the vessel wall, one should certainly see it. And even if there hadn't been a suture, simply the fact that a line had been in that vessel would have probably meant that the vessel wall may have been a little thickened or scarred and certainly, if one took a section to look at

under the microscope, one would probably be able to see that sort of reactive process, even if the lumen were still open and blood were flowing through it.

Q. But if a suture had been put in in February 1995, is it your view that given what you have said about compensating pathways and so forth, that that would still not be having a constricting effect on the blood flow?

A. A, at the site of the suture, one would expect to see the obstruction to the vessel and the healing reaction to the suture material. One would also expect to see that above this, as the blood flowing can't go that way, it would be re-diverted or there would be new channels forming around that area.

Q. And the effect of that is that the venous drainage wouldn't be compromised in that way?

A. The venous drainage may be compromised to a certain extent, but because there is so much plasticity and it's possible to shunt blood through different pathways, as long as those pathways remain available, then it shouldn't make a great deal of difference. I think that surgeons regularly put in lines and block off vessels and the body simply gets on with it.

Q. And if I can just take you to something that Dr Armour said when she was giving her evidence before

the coroner. It's 011-010-033. She says that:

"The suture impaired the blood flow to the brain and the catheter tip on the right may have had a role to play."

But then she goes on to say:

"The suture had been there for some time."

So if you're seeing a suture at all, as opposed to the evidence of where it was, if you're actually seeing a suture, does that give you any guidance as to how long it's likely to have been there?

A. If you can still see the suture material, it's probably very fresh. If, as sometimes happens, it's embedded in a fibrous reactive tissue, there may be a tiny little end that's sticking out of that, but you would expect to see a reactive tissue around the suture material.

Q. And how would you be able to form a view as to how long it was there if you wanted to do that?

A. By looking at it under the microscope.

Q. And if you thought it was having any effect at all, what should you do in relation to it?

A. First of all, if you think it's having an effect, you should photograph it because it's clinically very relevant to the cause of death and you should take a sample to examine under a microscope.

Q. Thank you.

A. Could I just add that on this page here, on page 33 of this transcription, that it says "the suture impaired the blood flow to the brain". But if we're talking about a vein, that's the blood coming out of the brain rather than into the brain, which is via arteries rather than veins.

Q. Yes. I think we've had some of these -- perhaps it's a slip from the person who was taking the transcript. This is not the hand of the person who's giving the evidence, so there will be a scribe who's taking it down and the significance of that may not have been appreciated.

A. Okay.

Q. But in any event, I think from what you said, whether it's going to or from, if it truly is constricted then it's going to have some sort of effect?

A. Yes, that's correct.

Q. Except to say, if one can go to -- maybe just in fairness -- 093-022-063. This is Dr Armour's statement to the PSNI. If you look almost two-thirds of the way down:

"The suture impaired the blood flow to the brain."

So she appears to have it there also. I think you have said that although --

MR BOYLE: It's a very small point, but if one looks at that

statement, it's actually just repeating -- because it says two lines above:

"In response to Miss Higgins, I said ..."

And then it's a quotation from the transcript rather than a witness statement.

MS ANYADIKE-DANES: Thank you. Just so that we understand, the next page to that, 059-036-072. Dr Armour was asked to comment on something and this is what she was asked to comment on. This is a letter from Dr Taylor to Dr Murnaghan, dealing with the post-mortem findings. And in the middle section there he has:

"Impaired cerebral perfusion."

He makes some criticisms and comments on what Dr Armour has found. Are you able to help as to what that means, what he's saying there? We start off with saying -- he says:

"There is no evidence of impaired cerebral perfusion ... Cerebral perfusion is defined as mean arterial pressure minus intracranial pressure."

Is that correct?

A. Yes.

Q. And then he says:

"Intracranial pressure was not monitored in this case and is never monitored except in head injuries as it involves an invasive monitor in the brain."

Is that the invasive monitor with the transducer that we looked at in the diagram that we had earlier, the square diagram?

A. Yes.

Q. That is the invasive monitor?

A. Yes.

Q. And then he says:

"Since MAP was maintained throughout the procedure, it is unlikely that there was cerebral hypoperfusion. Perhaps a better logical explanation would be impaired cerebral drainage, however this is against known ..."

Stopping there, is what you have said in terms of the difference between the cerebral perfusion and the fact that you're of a view that we're talking about impaired cerebral drainage?

A. Yes.

Q. Then he says:

"However, this is against known research, especially in this case where a recent article suggests that complete jugular ligation does not cause an increase in ICP."

Are you able to assist with that?

A. I think that this is probably what I have tried to explain. If you do tie-off a vessel, if there is time for compensation, unless it's absolutely acute and

unless there's no other way for the blood to go, it won't cause a huge amount of damage to the brain because the blood will find other pathways out of the brain. And we know there are plenty of them available.

Q. Thank you. Can I just ask you very briefly about hypoxia? In your report you say that -- well, to give you the reference, it's 206-002-005. You say:

"There is no significant pathology to indicate HLL [sic]."

What is that in this brain?

A. Sorry, that's HII, hypoxic-ischaemic injury.

Q. Thank you.

"Only a few cells in the [inaudible] show early [inaudible] death and there is no blood vessel change."

And so on.

So are you also coming to the view that there's no evidence that there was terminal hypoxia?

A. Yes, that's correct. Just to explain: we don't know, looking at the pathology, what the contribution of lack of oxygen or lack of blood supply may be. So we use both terms -- hypoxia being lack of oxygen, ischaemia being lack of blood supply, so we put them together. We don't usually talk about pure hypoxia. That's why we use HII. There are fairly specific findings in the brain that are associated with hypoxic-ischaemic injury

and there was really not a great deal of evidence in this brain that there been any extensive hypoxic-ischaemic injury.

Q. Is it possible for that not to show at the time you're carrying out the autopsy?

A. It is, because the brain cells take some time to respond and for us to be able to see those responses under the microscope. I have seen these changes within an hour-and-a-half of a child dying under anaesthetic, but usually one would say the first changes would be at about five or six hours and maybe 24 hours and we usually give ourselves a window of 1 to 2 days before we would really be able to be sure that we can see reactive changes in the brain.

Q. And if you do see them, what's the significance in terms of what Dr Armour was dealing with?

A. Well, it helps us to try and understand what the cause of the death and the brain damage may have been.

Q. What difference would it have made in a case like this where, as you have said, she's correctly identified that there was very significant cerebral oedema, it's produced coning. What difference would it have made if she had waited a little longer and identified any hypoxia?

A. Well, what would have had to happen is that the period

between the event and death would have had to be extended. So that would mean a longer period on ventilation. When we get into the same cascade that I mentioned earlier this morning, a lot of secondary changes are going on, so it gets very complicated. But essentially, the important factor would be to say: well, one of the things one would think if a child doesn't wake up after an anaesthetic is was there sufficient cerebral perfusion, was there sufficient oxygen? So it's important to look to see if that might have been one of the causes of the damage because the brain would also swell after hypoxic-ischaemic injury.

Q. I see. But when the child dies, in other words the ventilator is turned off, that's not something that is within the control of Dr Armour. She could hardly have said, "If you'll just wait a few more hours, I will be able to tell you whether there's any hypoxic damage". So she takes the body in the state that it comes to her and she deals with what she can see and describe and what she can conclude from that.

A. Yes.

Q. So is it simply that you keep your mind open that the fact that you don't see it, given what you know as to the time that has elapsed from the event and the death, doesn't necessarily mean that there wouldn't be

something that could have caused it if that time had been longer; is that the upshot of it?

A. That's correct, yes, and we're at a limit here at 24 hours in a baby on a ventilator. It may be that the changes just simply haven't had a chance to develop.

Q. Or that there's nothing there that's ever going to develop because that has nothing to do with it?

A. Yes, we simply can't tell.

Q. And then you also address the issue of anaemia. What's the significance of that if Adam was a bit anaemic?

A. Anaemia ... The haemoglobin in the blood is reduced in anaemia by definition and haemoglobin carries oxygen to the brain and, if a patient is severely anaemic, any reduction in blood flow or ambient oxygen levels may have more effect in a patient who is anaemic because the same volume of blood will be carrying less oxygen than in a patient who has a normal haemoglobin level.

Q. Just before I go on to one final question, in those last two questions where you've been dealing with effectively the oxygenation of the brain and you had mentioned there might be a concern about the anaesthesia or the anaesthetic equipment and so forth: you're the neuropathologist, if you'd been brought into this case, would you have wanted to know whether there was any investigation into the anaesthetic equipment? Would

that be relevant for you?

A. I would certainly want to know if the equipment had failed or if the gases had failed or if the anaesthetist hadn't monitored everything right the way through the operation. Yes, I would want to go back to those records.

Q. And then if we just go to the final question and, just to be clear, there's an issue about the dopamine that was given. I think it was given in a sort of low dose, almost from the start, and then two small boluses. Are you in a position in your discipline to be able to comment upon what difference any of that might make to what you're seeing as a neuropathologist?

A. No, I don't think so. I think that's out of my expertise.

Q. When you review the medical notes and records and you see during the surgery the medication, the drugs that have actually been administered, do you ever -- or is it appropriate for you to ask somebody as to what the effects of that are since that's not your area?

A. It is helpful when one's dealing with a very complex case. It's very easy to overlook that because it's something we don't -- I don't understand terribly well, the effects of particular drugs. But it may be helpful because it can help us to understand how they may

impinge on the blood flow through the brain, for example.

Q. And would that be a reason why you might want to discuss things with the treating anaesthetist?

A. Yes.

Q. Because he or she would be able to explain what those agents were and what the effects might be?

A. Yes and whether the doses given were normal and whether the responses to them were what the anaesthetist would expect.

MS ANYADIKE-DANES: Thank you very much indeed. Mr Chairman, I wonder if you'd just allow me two minutes?

THE CHAIRMAN: Of course.

MS ANYADIKE-DANES: I wonder if I might see if I have any more. Thank you.

(3.30 pm)

(A short break)

(3.42 pm)

MS ANYADIKE-DANES: Two questions. I am asking one and Mr Boyle is asking the other.

A little while ago, you were assisting us with if you were doing a brain-only -- and we're talking about 1995 -- and whether you had to be or whether it would be advisable to have a consultant neuropathologist

involved, and I think the answer that you were giving also partly to the Chairman's question was the label wasn't so important, it was important for their expertise, if I can put it that way, although in your unit, if it wasn't a consultant, you would give that person cover, I think you said, you would have a consultant sign off?

A. I would expect to go and just look at the final appearance before the head was closed so that I could sign off and agree that a trainee had done it correctly.

Q. Oh I see. So signing off isn't literally just signing off; signing off is to going and having a look at something?

A. In my practice, that's the case. But again, as we've said, it depends on the experience of the person removing the brain.

Q. I understand that. So the specific question -- because we had a look at the transcript and weren't entirely sure of how the answer was coming. The specific question is that if you're dealing with a brain-only post-mortem in 1995. Would you expect for that to be carried out by either a consultant neuropathologist or someone of the equivalent clinical status or experience?

A. I think it's really difficult to answer. I think in the circumstances of this particular case, Dr Armour was

well qualified and experienced and would be assumed to have been able to do this on her own without consultant cover in the terms of that experience. For my own personal practice, and I think even back in 1995, I wouldn't have expected one of my trainees to do it without me just having simply cast an eye over things to be sure that they had not missed anything.

Q. Yes. In this case, Dr Armour, of course, was conducting a full autopsy and her experience was being brought to bear over the body as a whole and the brain turned out to be a very, very important element of it, but was an element of it. If she had formed the view that actually it's such a significant element of it that that's the -- in the way that you described sometimes happens -- only bit that I really think we need to examine here, if she had formed that view, would you still have thought that that was sufficient or would you have thought that it should have been done by a consultant neuropathologist or somebody with that kind of expertise?

A. I think it would be reasonable if she had said, "Okay, I have taken the brain out, I have done the autopsy, I need some help, but I'll ask for that when the brain has been fixed, because it's probably going to be in the brain". If she had satisfied herself that she had looked at all those things pertaining to the brain and

the blood flow, then I think it was reasonable for her to wait until the brain is fixed to ask for help.

THE CHAIRMAN: It's a judgment call, really, on Dr Armour's part, isn't it?

A. It is indeed, yes.

THE CHAIRMAN: Can I just clarify one thing that I have now become unclear about?

When you say "getting a consultant to sign off", I had interpreted that earlier to mean effectively countersigning the end of the report, but is there more to signing off than that? Might it involve, for instance, if you were signing off as the consultant, would you look at the report and that might be your first and only port of call, but it might also then lead you back in to look at blocks and slides yourself?

A. I would expect the person asking or writing the report to show me material and they may come and say, "I've cut the brain, looked at it, I have all these slides, but these are the three I think you should look at".

THE CHAIRMAN: Okay, so it's not just adding a signature to the bottom of the page?

A. I think if your name's going to be on it, you should know that you're going to take responsibility for it --

THE CHAIRMAN: Thank you.

MS ANYADIKE-DANES: Just to follow up that because that was

something that I probably should have asked as well. When you said that you would expect a trainee, which is -- it's a bit of a misnomer, trainee. You may be at a very, very early stage of your career, but in fact a trainee, strictly speaking, is anybody up until you become a consultant. So it could be somebody quite experienced.

A. Yes.

Q. But when you just said that you would expect the trainee to come and show you the report and say, "Look, these are the blocks or the slides that I think are actually significant here, would you like to have a look at it?", does that mean that you, as a consultant, know what your trainees are doing? I mean in the sense that you would be aware of the kind of, if not the actual, the kind of autopsies that they're carrying out?

A. Yes, absolutely, and would know whether I was able to simply trust them to show me three things and know they'd picked out the relevant things or whether I would need to look at the whole case in detail myself to be sure that they had come to the right conclusions.

Q. And does that mean, just so that we understand, that if you have a department and you have two or three consultants in there and you have the trainees as well, does that mean that those consultants need to know what

autopsies, if I can put it that way, the non-consultants are carrying out?

A. Yes.

Q. Even if they're experienced and nobody's going to bat an eye and they can just get on with it, they need to know that?

A. Well, certainly now. I think in 1995 it might have been different and that certainly somebody like Dr Armour, who's been a member of the College of Pathologists for a number of years and is experienced, she may be allowed to be pretty independent.

THE CHAIRMAN: And the head or the consultant might trust her judgment about coming to her if she needs assistance or cover?

A. Yes.

THE CHAIRMAN: Okay.

MS ANYADIKE-DANES: So that would a practice that could be developed in the department and she would know that she is entitled to, maybe even expected, to do certain autopsies by herself without showing them or discussing them with anybody in particular unless she herself thought she had a concern?

A. Yes, because it doesn't seem to be that there's any actual guidance about whether it has to be a consultant who finally approves of the work that's being done and

the reports that are being written. This is why I'm finding it slightly difficult to answer these questions because we don't have any definite pattern of supervision. I think now it would be accepted that anybody who's not a consultant would have to be supervised and therefore have a consultant opinion.

MS ANYADIKE-DANES: Thank you very much indeed.

THE CHAIRMAN: Mr Boyle?

Questions from MR BOYLE

MR BOYLE: I ask questions on behalf of Dr Armour. It flows from some of the questions you were asked a moment ago. We are, of course, dealing with Adam, who was four years old and went into the hospital for a kidney transplant. There's nothing in his preoperative history that would have called for a neuropathologist to have been involved from the outset in performing an autopsy; is that fair?

A. I believe so.

Q. And there was nothing, as far as we are aware, in the clinical history that Adam had any preoperative signs of any neurological disease or abnormality?

A. No, I believe he was neurologically normal.

Q. And the history that the pathologist is therefore provided with is a boy who comes in for a kidney transplant, who suffers some kind of critical event during the operation?

A. Yes.
Q. The kind of thing that might happen during the course of an operation to give rise to cerebral oedema, swelling, might be, for example, blood loss, hypoxia, something to do with the equipment; correct?
A. Yes.
Q. Those would be probably your initial or your differentials to start out with?
A. Yes.
Q. None of those either would be a trigger for a neuropathological intervention at that stage, would they?
A. That's correct.
Q. So there was nothing untoward with Dr Armour beginning to perform this autopsy on Adam when she did?
A. No, I don't think so.
Q. Of course, Dr Armour has something of an advantage over anybody who comes to report on it later than her, someone like yourself, for example, because she has the advantage of naked eye, having seen the brain; yes? And I know you have adopted all of your reports, but in your initial report the only photographs that you had were the two poor black and white copies from the article by Dr Armour; isn't that right?
A. That's correct.

Q. It was those poor black and white copies that you compared with some colour photographs that you had from cases of your own?
A. Yes.
Q. You have now, of course, had the benefit of seeing the better quality colour photographs, all 20 of them?
A. Yes.
Q. And you refer to the swelling in some of those photographs as "severe", don't you?
A. Yes.
Q. That, of course, is simply just on an eye view, you didn't need to look under a microscope to come to that conclusion?
A. That's right.
Q. In relation to the number of cuts that we have of the brain, we have photographs of those too and you gave evidence about them this morning. Again, just looking at the naked eye, you were able to describe the swelling and the degree of swelling; isn't that right?
A. Yes.
Q. And likewise, viewing those cuts with the naked eye, you could see no evidence of hypoxia, ischaemia injury, the HII; isn't that right?
A. We can't tell that with naked eye, we need microscopy.
Q. As far as the cuts themselves are concerned, did you

carry out any microscopic analysis or were you simply reporting on that which had been reported before?

A. I didn't take any further tissue, I simply had the blocks that had already been sampled.

Q. And in those blocks that had already been sampled, there was no evidence, was there, of any neuropathological event? There was no tumour, there was no thrombosis of vessels, there was no evidence of meningitis, there was none of that?

A. No.

Q. And the conclusion that Dr Armour reached that here we had cerebral oedema -- and she refers of course, we know, to dilutional hyponatraemia -- that's a view with which you concur?

A. Yes.

Q. So without having referred it formally to a neuropathologist, she came to that view, although we know that there's a reference to Dr Mirakhur?

A. Yes.

Q. If, on a naked eye view, you have formed an opinion that this is gross cerebral oedema, there's swelling, you have taken cuts, it's been fixed and so on, if you yourself can't see any evidence of, for example, hypoxia, just to satisfy yourself that you're not missing anything you might, back in 1995, have

informally asked a colleague for a second opinion?

A. Yes.

Q. That appears to be what Dr Armour has recorded in her report. That would have been a perfectly acceptable thing to have done at that time?

A. Yes.

MR BOYLE: Those are all my questions, thank you very much.

THE CHAIRMAN: Thank you, doctor, thank you very much for your time and your contribution, it's been very, very helpful and you are free to leave.

Unless there's any other point which needs to be raised now, we'll reconvene tomorrow at 10 o'clock with Dr Armour. Thank you.

(3.55 pm)

(The hearing adjourned until 10.00 am the following day)