

## ADAM STRAIN

In the preparation of this report I have carefully perused the documentation presented to me by the Police Service of Northern Ireland.

I must stress that the comments I make and the answers to questions posed are only my opinion.

At the outset I largely stand by my report dated 22<sup>nd</sup> January 1996 which was read out in the Coroner's Court apart from the facts that I am corrected by Dr Taylor that the plasma he used intraoperatively was the type which contained sodium and that the transplanted kidney was found to be infarcted at post-mortem.

The verdict on the Inquest states the cause of death to be cerebral oedema due to Dilutional Hyponatraemia and impaired cerebral perfusion during renal transplant operation for chronic renal failure (congenital obstructive uropathy) My own opinion agreed with that as the findings were gross cerebral oedema and coning and other obvious causes of this such as hypoxia having been ruled out. Dr Taylor himself produces a paper which negates the argument that there might have been some obstruction to venous drainage from the head as a causative factor.

In any operation the anaesthetist is the person primarily responsible for the fluid management. I understand that there was a trainee present whose name is on the anaesthetic form (Page 916) but is illegible in the copy I have looked at. The role of the surgeon in the fluid management is variable, but in my experience the surgeon usually checks from time to time that everything is under control.

I note that Dr Taylor says that the fluids were discussed with others in the theatre, but does not say whom.

Dr Taylor says that Adam was polyuric, but I could only find urine volumes after the operation. There is no note of urine output during the operation. There was a suprapubic catheter in place and at least for the early part of the procedure urine output could have been measured. I note that after the operation, urine volumes from the catheter were 49, 115 and 35 ml in the first 3 hours postoperatively. However, there is no way of telling whether these figures relate in any way to the volumes being passed pre- or intraoperatively.

I was taught and it was our practice that in polyuric phases, if the patient is not drinking, half the urine volume is replaced by the intravenous route, but as normal saline each hour.

Dr Taylor relates his administration of dextrose-saline to this polyuria and suggests this urine volume was 150ml per hour, which was required to be replaced.

Adam had been dialysed overnight and the measurement of electrolytes is mandatory after that. They had tried to obtain blood before Adam went to theatre but were unable to achieve venepuncture. In my experience it routine to measure electrolytes after dialysis and even more necessary if this has been done just prior to major surgery. Electrolytes which are usually measured automatically from a blood sample by a machine in the laboratory and include serum levels of sodium, potassium, chloride,



magnesium, bicarbonate, urea and creatinine (the latter two give an indication of renal function. The sodium, potassium and bicarbonate levels can also be measured during a blood gas analysis. These machines are either put in the operating room suite, intensive care unit or very close by for the use of the anaesthetists and the intensivists. Although blood gas analysis is primarily intended for the measurement of the blood (usually arterial) acidity (pH) oxygen and carbon dioxide levels, they also give a reading for sodium and potassium.

The dialysis sheet is page 810 and I note that the fluid balance for the peritoneal dialysis has not been filled in. This is a pity because it gives some idea of how fluid depleted, or otherwise Adam was likely to have been after the dialysis.

I do not agree with Dr Alexander (Page 28) when he says "with the benefit of hindsight..." They had tried to obtain blood before the operation so it was in their mind to measure the electrolytes which is the correct thing to do.

I do not understand why they did not do blood gases and electrolytes soon after arterial access had been obtained in theatre. The result at 0930 shows a picture of dilution, both of sodium and of haemoglobin, though blood loss not replaced with blood could have contributed to the low haemoglobin.

The management of the electrolytes and acid-base state is the primary responsibility of the anaesthetist in charge of the case.

To try to summarise:

My impression is that Dr Taylor acted in good faith but I believe he made some errors of judgement.

The fluid management in this situation is a very complex affair as the various requirements for replacement of deficits, ongoing hidden and obvious losses (evaporation and bleeding) and the amount being lost via urine all require minute-to-minute judgements based on clinical and biochemical findings.

If Adam died from dilutional hyponatraemia and its acute cerebral effects, then, in my opinion it must have been the volumes of intravenous dextrose-saline which contributed to this.

Dr Taylor had done initial calculations which he justifies, but in my opinion the administration of 500 ml dextrose-saline over a 30 minute period and a further 500ml over the next 75 minutes was too much of this solution which is basically water, over too short a time and is in excess of his calculations.

I now understand that there was and indeed probably still is widespread ignorance concerning hyponatraemia, in spite of papers on the subject in prominent medical journals from the 1980s. The ignorance was that a dextrose-saline (0.18% saline) solution while being a reasonable choice for use strictly as a maintenance fluid, cannot be used to replace abnormal losses such as bleeding or diarrhoea and vomiting in which the losses are primarily sodium chloride.

What is harder to understand is the delay in measurement of the blood gases and electrolytes until 0930 and I have never seen a satisfactory explanation for this. Although a laboratory result would probably take one hour (possibly more at that time

of day) instant information is available from blood gas results. The machine for measuring this is usually in theatre or at least nearby in the intensive care unit. In my opinion this was an error of judgement.