Reviewer's report

Title: Dialysis Disequilibrium Syndrome: Brain death following hemodialysis for metabolic acidosis and acute renal failure - A case report.

Version: 1 Date: 14 July 2004

Reviewer: Cornelius J. Doorenbos

Reviewer’s report:

General
Thank you very much for the opportunity to review this interesting manuscript.

1. This seems to be a well described case that can be used for educational purposes as a necessary reminder of an important clinical lesson.

2. The cerebral edema in this unfortunate patient may be related to the dialysis procedure. This seems to have been a standard treatment, possibly during 4 hours with a normal blood flow as used in Europe, resulting in a urea reduction of 70%, as recommended for chronic hemodialysis patients. However, these chronic patients should have a blood urea nitrogen of around 27.5 mmol/L (77 mg/dl) before and 8.5 mmol/l (23 mg/dl) after dialysis, resulting in an osmolality decrease of 19 mosmol/kg. In the case described, the urea fell by 33 mmol/L and therefore the osmolality decreased by 33 mosmol/kg. Furthermore, the bicarbonate in chronic dialysis should rise by around 7 mmol/L from 20 before to 27 after dialysis, whereas in the case, it increased by 17 mmol/L from 2 to 19. This contributed to an increase of the pCO2 from 10 to 42 mm Hg. Because CO2 probably crosses the blood-brain barrier more rapidly than bicarbonate, a decrease of intracerebral pH may be expected. The cerebral acidosis, in addition to the reverse osmotic shift of urea, may contribute to the observed dialysis disequilibrium syndrome and cerebral edema.

3. The lesson of this case, as already discussed in some detail by the authors, should be, that the dialysis prescription in acute cases should be adjusted to the particular circumstances of the patient. This may deserve some more emphasis in the text.

4. In this case, a shorter treatment time of 2 hours, with a lower blood flow of 150 ml/min and possibly with blood and dialysate flowing in the same direction instead of the usual countercurrent arrangement, with a lower dialysate bicarbonate level of 32 mmol/L and repeated dialysis as necessary after allowing enough time for reaching equilibrium, might have avoided the disequilibrium syndrome.

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Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

1. Can the authors explain why the potassium decreased from 3.1 to 1.8 mmol/L during dialysis with a dialysate potassium of 3 mmol/L? Is the rapid correction of the acidosis, resulting in a potassium shift into the cells, sufficient explanation?

Why was the potassium low in the first place, considering the severe acidosis and renal failure?

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Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

1. There are no numbers in the text referring to the references. These should be inserted in the text.

2. On page 2, the bicarbonate could be mentioned immediately after the PaCO2 instead of after the sodium. The osmolality is measured in mosmol/kg, not mmol/kg.

3. The manuscript might benefit from an expanded Table 1, mentioning all the available laboratory results at the relevant moments: on admission, after the bicarbonate infusion, at the start of dialysis, the moment of neurological deterioration, at the completion of dialysis and when brain death was
declared.

4. On page 5, what was the volume and the concentration of the administered bicarbonate? What was the effect on the acidosis? (See above)

5. Because the patient has a urethral meatus stenosis on page 4 and bilateral hydronephrosis was seen on the CT scan on page 5, probably a bladder catheter was placed and that might be mentioned in the text.

6. Was the employed femoral catheter single or double lumen?

7. What was the ultrafiltration rate during dialysis?

8. On page 5, what was the duration of the dialysis treatment?


Discretionary Revisions (which the author can choose to ignore)

1. On page 2, the diagnosis pneumonia is mentioned. In view of the results of the cultures of blood and urine on page 5, the patient seems to have had urosepsis. At autopsy on page 6, the kidneys were pyonephrotic, but the lungs are not mentioned at all.

2. What is the meaning of the fact, that the leucocytes in the urine were reported on page 5 as being large?

3. On page 5, which empiric antimicrobials were started?

4. Could the authors describe the expertise of Dr. Bruce Culleton? It might interest the readers to know, whether the case and the manuscript were discussed with a nephrologist.

What next?: Accept after minor essential revisions

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No

Declaration of competing interests:

None