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Rachel Ferguson (Deceased) - Inquest at Belfast Coroner's Court 26 & 27/11/02

Date of birth: 04.02.92 **Date of death: 10.06.01**

This report has been prepared at the request of the Directorate of Legal Services, Central Services Agency following review of photocopied material from the casenotes relating to the admission of this girl to Altnagelvin Hospital in June 2001, together with other material.

Rachel was admitted with abdominal pain suggestive of acute appendicitis on 07.06.01 and subsequently underwent emergency appendicectomy. She was healthy and well with approximate weight 26 kgs and her preoperative blood investigations were normal (serum sodium 137mmol/l). Post-operatively she was initially felt to be making good progress but had vomiting and headache. At approximately 03.00 on 09.06.01 she began to have severe seizure activity with further subsequent deterioration despite resuscitation and intensive care. Unfortunately she subsequently died and evidence on CT scan and at post-mortem was consistent with the diagnosis of cerebral oedema related to hyponatraemia.

Her sodium was found to be 119 at 03.30 on 09.06.01 with a repeat specimen at 04.30 giving a result of 118, associated with low levels of potassium and magnesium. Rachel had received Hartmann solution during her surgery but subsequently this was changed to solution 18 (0.18% saline with 4% dextrose) at a rate of 80 mls/hr. She received a total of 400 mls between 02.00 and 07.00 and a further 1680 mls between 07.00 and 04.00 the following morning (09.06.01).

Comment

Solution 18 has been routinely used in Paediatric medical practice for a very long time and is rarely associated with any acute electrolyte disturbances such as were seen in this tragic case. However, this is largely related to the range of conditions commonly seen by Paediatricians and cared for within the medical (as opposed to surgical) environment. By and large these are not associated with the syndrome of inappropriate secretion of antidiuretic hormone. It has become increasingly recognised in recent years that a regime utilising solution 18 may not provide the right balance of sodium and free water for children with some clinical conditions, and particularly where there is an increased likelihood of failure to excrete water. This would include situations of stress, pain and nausea, and may be particularly common in the post-operative period.

This was well described in an editorial in the Journal "Paediatric Anaesthesia" in 1998 by Dr Arieff, but did not receive widespread publicity in journals likely to be read by most Paediatricians or Surgeons caring for children at that time. The potential dangers were highlighted to a wider clinical community in an article published in the British Medical Journal of 31.03.01 by Halberthal et al. However, it has to be said that this topic is not well covered in a number of standard paediatric texts. Many Paediatric Units were still using their traditional regimes based on solution 18 until further concerns were raised within Northern Ireland in September 2001 as a result of two deaths. Steps were taken to convene a Working Group who have subsequently prepared and distributed guidance on the prevention of hyponatraemia in children under cover of a letter from the Chief Medical Officer dated 25.03.02. This highlights the dangers of this condition and gives guidance as to how these can be minimised in everyday clinical practice.

While it is possible in retrospect to form the opinion reached by Dr Sumner that Rachel must have suffered severe and prolonged vomiting, this does not seem to have been the assessment of her

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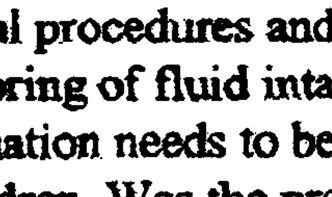
condition made by experienced staff at the relevant time. Sr E Millar records in her statement that "During the morning Rachel became increasingly more mobile and was able to walk to the bathroom with her dad. Rachel also was sitting up on the side of the bed colouring in and generally being bright and happy. Rachel vomited undigested food at 10.30a.m. and again at 1.00p.m. and 3.00p.m. but not large amounts. Rachel continued to be stable and in good form and gave no cause for concern." It seems that some individuals can develop a severe form of this condition in circumstances which are clinically no more severe than those experienced by many children in the post operative period and the reasons for this degree of susceptibility are currently not understood. It is for this reason that guidance has now been prepared and issued to increase awareness of this previously poorly recognised condition and to ensure that Units providing care for children take steps locally to introduce care pathways and/or fluid management regimes which take account of this possibility and minimise the risks of occurrence.

The deterioration in Rachel's condition occurred rapidly. The possibility of an electrolyte disturbance being the cause of the fit was considered by Dr Johnston and efforts made to obtain electrolyte results from the laboratory urgently. However, even by the time these became available her condition had further deteriorated and her pupils were found to be dilated and not reacting to light (evidence that increased intracranial pressure due to cerebral oedema had already caused pressure damage within the brain). Despite prompt resuscitation and further investigation and management this damage proved irreversible and led to the tragic outcome of her death.

Conclusion

Having carefully studied the statements provided by the doctors and nurses involved in Rachel's care my impression is that they acted in accordance with established custom and practice in the Unit at that time. It is however important that further details are obtained of relevant nursing and medical procedures and management in relation to fluid administration and post-operative monitoring of fluid intake, urine output and other losses such as vomiting. In particular information needs to be obtained regarding the local policy for post-operative fluid administration in children. Was the prescribed regime in this case in keeping with this guidance? If it can be confirmed that the frequency and severity of Rachel's vomiting was not outwith the degree expected by experienced staff in these circumstances and that the staff involved acted in accordance with local policies and guidance then, in my opinion, their actions do not amount to negligence.

The tragic outcome in this case rather highlights the current situation whereby one sector of the medical profession can become aware of risks associated with particular disease processes or procedures through their own specialist communication channels, but where this is not more widely disseminated to colleagues in other specialties who may provide care for patients at risk from the relevant condition. In the circumstances relating to this incident, it was only the tragic deaths of two children in Northern Ireland which alerted the wider clinical community to these concerns. These have subsequently been assessed and relevant guidance prepared and disseminated as outlined above.



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