

DEPARTMENT OF NEUROPATHOLOGY  
AUTOPSY REPORT

Autopsy No.: NPPM 61/2001

Name : FERGUSON, Rachel

Date of Birth: 4-Feb-92

Hospital No.: CH 476554

Sex : F

Hospital: RBHSC

Pathologist : Dr M Al-Husaini/

Dr B Herron

Ward : PICU

Clinician : Dr P Crean

Date of Admission : 9-Jun-01

Date of Autopsy : 11/6/01

Date of Death : 10-Jun-01

Time of Autopsy : 10.00am

Time of Death : 12.09 pm

Restrictions : Coroner's case

Organs Retained: Brain and spinal cord

ANATOMICAL SUMMARY

SNOMED 3 CODES

History of appendicectomy 07/06/01 Altnagelvin, history of seizures 09/06/01 and brain stem death 09/06/01 at 12.09pm, acute cerebral oedema, aspiration pneumonia (see commentary).

P3-42000 TA0100 M36300

*[Handwritten signature]*  
20/11/01

CLINICAL SUMMARY

She was admitted to Altnagelvin Hospital on 7/6/01 with abdominal pain and was diagnosed as having appendicitis. Appendicectomy was done on the same day and she was doing well after that. On 8/6/01 she was conscious and able to walk. However, she vomited 6 – 7 times but there was no fever or diarrhoea. On 9/6/01 at 3.00am she developed tonic seizures which lasted for 15 minutes. She received medication but did not improve. Soon after this she developed fixed dilated pupils with petechial haemorrhages on the anterior chest wall and possibly aspirated. An urgent CT scan showed possible subarachnoid haemorrhage with evidence of increased intracranial pressure. Electrolyte analysis showed sodium level of 118 mg./dl and potassium of 3 mg./dl. She was intubated and transferred to the RVH on 9/6/01. A second CT scan showed cerebral oedema and she was pronounced brain stem dead on 9/6/01 at 12.09 pm.

014-005-006

EXTERNAL EXAMINATION

The body is that of a female child with features in keeping with that of the age of the deceased. She weighed 25 kg. Head circumference is 144 cm. Crow-heel is 120 cm. Average foot length is 19 cm. Petechial haemorrhages were noted on the anterior chest wall.

INTERNAL EXAMINATION

BODY CAVITIES:

There is no pleural or pericardial effusion and there is no ascites.

HAEMATOPOIETIC SYSTEM:

Spleen This weighs 95.2 g. and appears unremarkable.

Histology shows this is congested.

Thymus This weighs 16 g.

This shows no abnormality.

MUSCULO-SKELETAL SYSTEM:

No fractures are seen. No muscle wasting is seen.

The muscles examined show no abnormality.

RESPIRATORY SYSTEM:

Lungs The right lung weighs 193 g. and left lung weighs 219 g. Both show haemorrhage in keeping with aspiration. There is no petechial haemorrhage on the pleural surface.

There is pulmonary oedema and haemorrhage with only occasional neutrophils. These features suggest the possibility of aspiration.

CARDIOVASCULAR SYSTEM:

Heart This weighs 137 g. There is no atrial, valvular or ventricular lesion. The aorta is unremarkable. The coronary arteries appear normal.

There is patchy myocardial inflammation and pericardial inflammation in keeping with stress haemorrhage secondary to cerebral oedema. It does not appear ischaemic in distribution.

DIGESTIVE SYSTEM:

Oesophagus, stomach, small and large intestine There is no lesion.

Histology of the oesophagus shows no pathological abnormality. The small and large intestine are autolysed, but show no definite abnormality. There is no peritonitis.

The site of the appendectomy was clean and showed no inflammation.

Liver This weighs 783 g. and shows no focal lesion.

There is no abnormality.

Gallbladder This is present and the biliary system is patent.

Pancreas This shows no abnormality.

GENITO-URINARY SYSTEM:

Kidneys The right kidney weighs 770 g. The left kidney weighs 760 g. Both appear unremarkable. The collecting system is unremarkable.

There is no interstitial inflammation or acute pyelonephritis. There is no tubular necrosis and the glomeruli appear normal.

Bladder This is unremarkable.

ENDOCRINE SYSTEM:

Adrenals The combined adrenal weighs is 7.4 g.

These are unremarkable.

Thyroid This is unremarkable.

Parathyroids These are unremarkable.

Pituitary This is slightly congested, but shows no definite evidence of necrosis.

NERVOUS SYSTEM:

BRAIN DESCRIPTION

The brain weighs 1,475 g. On external examination the brain is quite pale. There is diffuse swelling with effacement of sulci and flattening of gyri. There is no infarct and there is no subarachnoid haemorrhage. On examination of the base of the brain the anatomy is normal. There is no abnormality to the blood vessels. There is bilateral uncal swelling and bilateral uncal necrosis.

On examination of the coronal sections the presence of diffuse cerebral oedema is confirmed with effacement of the ventricular system and slight caudal descent. There is no shift. There is evidence of diffuse hypoxic ischaemic necrosis due to perfusion failure with discoloration at the grey/white matter junction. However, there is no regional cortical lesion. The laminar pattern is normal. There are no heterotopias or suggestions of migration abnormality. The hypothalamus does not appear necrotic although the mamillary bodies are slightly elongated but this is more likely is an effect of cerebral oedema. There are no peticule haemorrhages. The brain stem and especially the pons appears normal. There is no intrinsic abnormality in the cerebellum. The cord appears normal.

9/7/01 DB

014-005-009.

## HISTOLOGY

### Meninges

There is no acute meningitis. Very few inflammatory cells are present in the meninges which appear reactive in nature.

### Cerebral Cortex

This has been examined in multiple areas and shows cerebral oedema and established diffuse hypoxic ischaemic necrosis as suggested by the macroscopic findings. There is no laminar necrosis and there is no abnormal inclusion seen. There is no encephalitis.

### Deep Grey and White Matter

These show the changes of cerebral oedema, but no other abnormality.

### Hippocampus

Oedema is present and very early acute changes of diffuse hypoxic ischaemic necrosis are seen.

### Hypothalamus

Oedema is present, but there is no anatomical abnormality.

### Brain Stem

This has been serially sectioned. It shows focal evidence of diffuse hypoxic ischaemic necrosis with neuronal necrosis. There is no evidence of central pontine myelinolysis.

Spinal Cord

There is no intrinsic abnormality, but a few mononuclear cells are present in the meninges suggestive of origin in the cerebellar tonsils.

21/11/01 jl

COMMENTARY

She had her appendix removed on 07/06/01 and developed seizures on 09/06/01. At autopsy she had cerebral oedema and aspiration pneumonia from which she died. Specialist opinion was sought as to the likely cause of the cerebral oedema and a report is enclosed. The summary of this was that the oedema was caused by rapid fall in plasma sodium concentration as a result of net sodium loss, coupled with hypotonic fluid administration in a situation (ie. post operative state +/- vomiting) where a normal physiological response inhibited the effective excretion of the excess free water. The abnormality of sodium balance and thus the cerebral oedema which led to her death was thought to be caused by three main factors:- 1. Infusion of hypotonic fluids, 2. Profuse vomiting, 3. Anti-diuretic hormone (ADH) secretion.

Established changes related to sodium imbalance such as central pontine myelinolysis were not seen possibly due to short time period between her deterioration and death. The relative contribution of these factors are unknown and as a combination they led to the brain swelling which eventually led to her death.

Cor.1

DEPARTMENT OF NEUROPATHOLOGY

INSTITUTE OF PATHOLOGY, GROSVENOR ROAD, BELFAST

Name: FERGUSON Rachael Age: 9 yrs Sex: F P.M.No.: NPPM 61/2001

Date of Admission: 09/06/01 Ward: PICU, RBHSC Date of Death: 09/06/01

Date of Autopsy: 11/06/01

Place of Autopsy: Mortuary, RVH

On the instruction of H.M. Coroner, Mr. J.L. Leckey, LL.M. – Dr.  
Department of Neuropathology, Institute of Pathology, Grosvenor Road,  
Belfast, Northern Ireland, made a post mortem examination on the body of:-

Rachael Ferguson

Aged: 9 yrs

Identified to Dr B Herron

By Constable MB Adams  
Grosvenor Rd

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CLINICAL SUMMARY

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014-005-012.

Cor.2

P.M. No.: NPPM 61/2001

My findings are consistent with death having taken place on

- |      |   |                               |
|------|---|-------------------------------|
| (I)  | Disease or condition directly<br>Leading to death:  | Ia. Cerebral oedema<br>due to |
|      | Antecedent causes. Morbid<br>conditions, if any, giving rise<br>to the above cause, stating the<br>underlying condition last. | b. Hyponatraemia              |
| (II) | Other significant conditions,<br>contributing to the death but<br>not related to the disease or<br>condition causing it.      | II.                           |

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COMMENTARY

She was admitted on 07/06/01 for an appendicectomy because of abdominal pain. On 09/06/01 she developed seizures and was noticed to have a low sodium level in her blood. Expert opinion was sought on the cause of this and an additional report is enclosed. It suggested the low sodium was due to a combination of three causes including infusion of fluids post operatively which contained a low sodium concentration. Other factors were the vomiting in the post operative period and the stress of surgery causing secretion of other chemicals. The expert stated that the relative contributions of these factors are unknown and as a combination they led to this brain swelling which eventually led to her death.

BM 4/2/01

014 - 005 - 013.