

Final anatomical diagnosis :

- I. Acute encephalomyelitis due to enterovirus 71 with the involvement of :
 1. Bilateral cerebral hemispheres; fornix, white matter of frontal lobes and gray matter of parietal lobes
 2. Bilateral hypothalamus
 3. Midbrain; red nucleus and substantia nigra
 4. Pons; tegmentum and basis pontis
 5. Medulla; inferior olive complex and reticular formation
 6. Cerebellum; dentate nucleus and white matter
 7. Spinal cords, cervical, thoracic and lumbar; dorsal, intermediate and ventral horns
 8. Enterovirus 71 identified by IFA method from medulla and spinal cords
- II. Severe pulmonary edema and hemorrhage of bilateral lungs
- III. Mild diffuse alveolar damage of bilateral lungs
- IV. Mild microvesicular fatty change of liver
- V. Moderate biventricular hypertrophy of heart
- VI. Pleural effusion, serosanguinous, 20 C.C. each side
- VII. Pericardial effusion, serosanguinous, 5 C.C.
- VIII. Ascites, serosanguinous, 20 C.C.

Clinical summary :

This 8 year-old girl was admitted to our hospital on 6/7/1998 with a history of fever, oral ulcer, constipation, headache and vomiting for 2 days. Skin rash over both soles, distended urinary bladder and stiff neck were note by physical examination. WBC count was 153/MM with 70% neutrophil, 76 mg/dl sugar level, and total protein level was 43 mg/dl . Brain CT was normal. Pain of the right forearm was complained also. Cyanosis was noted and she was intubated. Tachypnea, tachycardia, hypoxia and severe metabotic acidosis developed in ICU. CXR showed pulmonary edema. The patient expired 4 hours after intubation on 6/8/1998 at 4:50 PM.

Autopsy findings :

(1) Body and external appearance :

Development	Good
Nutritional state	Good

(2) Body cavities :

Pleural	Serosanguinous fluid : Right : 20 C.C. Left : 20 C.C.
Peritoneal	Serosanguinous fluid : 20 C.C.
Pericardial	Serosanguinous fluid : 5 C.C.

(3) Cardiovascular system :

Greater vascular structures	Normal in position
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Heart General :			
Weight	130 GM	Pulmonary valve	5.1 CM
Left ventricle	1.7 CM	Mitral valve	7.2 CM
Right ventricle	0.8 CM	Aortic valve	4.4 CM
Tricuspid valve	7.1 CM		

Cardiovascular system	Gross	Microscopic Diagnosis
Valves	Unremarkable	
Epicardium	Unremarkable	No pathological diagnosis
Endocardium	Unremarkable	No pathological diagnosis
Coronary arteries	Unremarkable	

Myocardium	
Gross	Unremarkable
Microscopic Diagnosis	Moderate myocardial hypertrophy is seen. Focus of a mixed acute and chronic inflammatory cell infiltrate is seen. Ischemic change or fibrosis is found.

(4) Respiratory system :

Trachea and major bronchi	
Gross	Mucosa : Pink to Tan

Lung		
Weight	Right	190 GM
	Left	160 GM
Microscopic Diagnosis	Marked and diffuse pulmonary edema. Focal hyaline membrane formation is present. No viral inclusion or apparent inflammation is seen.	

Mediastinum	
Gross	Thymus : 5GM
Microscopic Diagnosis	No pathological diagnosis

(5) Gastrointestinal Tract :

Gastrointestinal Tract	Gross	Microscopic Diagnosis
Pharynx	Unremarkable	
Esophagus	Unremarkable	No pathological diagnosis
Stomach	Unremarkable	Autolysis is seen
Duodenum	Unremarkable	Autolysis is seen
Small bowel	Unremarkable	Autolysis is seen
Large bowel	Unremarkable	Autolysis is seen
Cecum and appendix	Unremarkable	Autolysis is seen
Pancreas	Yellow to tan and lobulated	No pathological diagnosis

(6) Hepatobiliary system :

Liver		
Gross	Weight	270 GM
	Out surface	Smooth and brown to tan
	Cut surface	Mild focal subcapsular hemorrhage with homogenous brown to pan.
Microscopic Diagnosis	Diffuse microvesicular fatty change of the hepatocytes is seen. No viral inclusion is found.	

Gallbladder, Bile ducts	
Gross	Unremarkable

(7) Hematopoietic-Lymphoid system :

Spleen	
Gross	Weight : 90 GM
Microscopic Diagnosis	Marked congestion is seen

Lymph nodes	
Gross	Mesenteric nodes are enlarged
Microscopic Diagnosis	Lymphoid hyperplasia without hemophagocytic histiocytes seen.

Bone marrow	
Gross	Tan in color
Microscopic Diagnosis	Mild hypercellularity with erythroid hyperplasia is seen. No hemophagocytic histiocytes are found.

(8) Urogenital system :

Kidney					
Gross	Weight	Right	70 GM	Left	68 GM
	Well-demarcated corticomedullary junction is seen.				
Microscopic Diagnosis	Moderate congestion is seen. No inclusion body is found. No acute tubular necrosis is present.				

Urogenital system	Gross	Microscopic Diagnosis
Ureters	Unremarkable	
Bladder and urethra	Unremarkable	No pathological diagnosis
Uterus/Ovaries	Unremarkable	No pathological diagnosis

(9) Endocrine system :

Endocrine system	Gross	Microscopic Diagnosis
Thyroid	Unremarkable	No pathological diagnosis
Adrenals	Right : 5 GM	No pathological diagnosis
	Left : 5 GM	
	Unremarkable	

(10) Central nervous system :

Brain				
Gross	Weight	1350 GM	Shape	Normal
	No tonsillar or uncal herniation is seen. No brain edema is noted.			
Microscopic Diagnosis	Multifocal inflammatory cell infiltrates composed of mainly neutrophils are present in fornix, frontal lobe, parietal lobe bilateral hypothalamus as well as midbrain, pons and medulla. The Entire spinal cord is involved in the areas of ventral and dorsal horns. The dentate nucleus and white matter of cerebellum are also affected. Perivascular cuffing by primarily mononuclear inflammatory cell are present. Neuronal necrosis and neuronophagia are found. Focal demyelination is noted in cervical spinal cord. No reactive change in vessels, astrogliosis or acute ischemic change is noted.			

Section Taken and Labeled as :

Labeled	Section Taken
RV, LV, A. B. C.	Right and left ventricles of heart
RU, RM, D. E. F.	Right upper, middle and lower lobes
LL, LU, G. H.	Left upper and middle lobes (缺 LU 蠟塊)
I, E1	Right and left kidney (缺 E1 蠟塊)
J, V	Right and left lobes of liver
L, M	Right and left adrenal glands
N	Urinary bladder
O	Mesenteric lymph nodes
P, Q	Pancreas, head and body
R	Thymus
II	Skin of soles
TH	Thyroid
U	Small bowel
W	Spleen
X	Large bowel
Y	Stomach and esophagus
BO 1, BO 2	Bone marrow
B 1-2	Left frontal lobes
B 3	Left caudate nucleus
B 4, B 8	Left and right hypothalamus
B 5, B 6	Left amygdala and olfactory nerve
B 7	Left superior temporal lobe
B 9	Left substantia nigra
B 10	Left and right hippocampus
B 12	Left parietal lobe

Labeled	Section Taken
B 13	Left occipital lobe
B 14, B 15	Pons
B 16, B 17	Medulla
B 18, B 19	Medulla
B 20, B 21	Cerebella
B 22	Vermis
B 23-25	Cervical, thoracic and lumbar spinal cord
B 26-32	
X 1-5	
SC 1-4	
K, S, T, TR, RL, Z	

Fresh sterile tissues taken for viral culture and RT-PCR. Frontal lobe, parietal lobe, pons, medulla, cervical, thoracic and lumbar spinal cords. Heart, lung, liver and pancreas.

Final Comments :

Enterovirus 71 (EV71) infection was initially reported in the united states in 1974, subsequent outbreaks were encountered in Bulgaria, Brazil and Japan. Hand, foot and mouth disease, encephalitis, aseptic meningitis and polio-like paresis are the major clinical manifestations. One may predominate in some cases or more than one may be present in other cases. Infants and young children are the chief victims. The largest outbreak was the one on Bulgaria where over 705 cases were found and 149 of them developed paralysis and 44 patient died. The current outbreak on Taiwan seems similar to that in Bulgaria. Although the clinical prolifes are variable, neurologic disorders are always seen in cases, the clinical course of the fatal cases were characterized by a rapidly downhill course with complications of pulmonary edema and hemorrhage. Autopsy findings correlate well with the clinical presentation in our case. The brain and spinal cord were the major sites of involvement. EV71 were identified by IFA method from medulla and all spinal cord. Whereas other organs such as heart, lungs, liver and pancreas were spared. Lungs showed mainly marked edema and hemorrhage with focal hyaline membrane formation. The heart was hypertrophic without evidence of inflammation or viral infection. Therefore, the main cause of death was acute encephalomyelitis due to EV71 infection.

Reference :

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