案例．13	Sex：♀	Age：4 month-old

Date : 2017/03/24

Final anatomical diagnosis：

I. Cytomegalovirus infection with involvement of multiple organs.
   1. Bilateral lung with diffuse alveolar damage.
   2. Gastrointestinal tract with foci of muscular necrosis in large intestine.
   3. Bilateral ovaries with extensive necrosis.
   4. Bilateral kidney
   5. Bilateral thyroid gland
   6. Thymus
   7. Intrahepatic biliary duct

II. Genetically confirmed TTC7A defect, with multiple intestinal atresia with combined immunodeficiency (MIA-CID) phenotype.
   1. Multiple intestinal strictures.
   2. Lymphoid depletion in gastrointestinal tract.
   3.Hypoplastic thymus with lymphoid depletion.

III. Hepatosplenomegaly
   1. Hepatic hemorrhagic central lobular necrosis.
   2.Splenic extensive necrosis.

IV. Focal ischemic neuronal necrosis of brain with mild meningitis.

Clinical summary：

This three-month-and-twenty-two-day-old girl was delivered full-term by G3P3 mother via normal spontaneous delivery. The birth weight was 3040g. No perinatal insult was documented.

Five day after birth, due to frequent postprandial vomiting, she had undergone duodenal resection with primary anastomosis under the impression of type B congenital pyloric atresia. After the surgery, symptoms such as watery diarrhea, feeding intolerance and mottling skin persisted. During her admission at Changhua Christian Hospital, lymphocytopenia, albuminemia and immunoglobulinemia were noted. She was treated as protein-losing enteropathy. The lymphocyte subset analysis showed 57.4% CD3 + T-cell ; 30.5% CD19 + B-cell; 34.5% CD4 + T-cell; 20.8% CD8 + T-cell; 9.0% CD3-CD56 + NK-cell and 1.2% CD3 + HLA-DR + activated T-cell. Esophagogastroduodenoscopy and rectoscopy showed fragile gastric mucosa and diffuse inflammatory over the gastrointestinal mucosa. The biopsy specimen report ulcers with granulation tissue, neutrophils infiltration and necrosis. On 2016/12/09, she developed pneumoperitoneum. A jejuna perforation was identified 20 CM distal to Treitz ligament and the patient underwent primary report. According to her mother, the patient's older sister had similar symptoms including frequent diarrhea, postprandial vomiting and failure to thrive. Genetic analysis was therefore performed and the patient was reported to have tetratricopeptide repeat domain 7A (TTC7A) deficiency. Because of complicated medical condition, the patient was transferred to Linkou Chang Gung Memorial Hospital on 2017/01/16.

During the admission, the patient was under multiple antibiotics and immunosuppressants. Her older brother was matched for HLA typing and bone marrow transplantation was schedules on 2017/02/23. However, she developed acute respiratory distress, acute hepatitis, shock and metabolic acidosis. Despite intensive treatment, the patient expired on 2017/02/20.

Autopsy findings :

(1) Body and external appearance :

Weight	4600 GM	
Length	52.7 CM	
Circumference	Head	38.7 CM
	Thorax	38.3 CM
	Abdomen	39.5 CM
Crown-rump	42.3 CM	
Crown-feet	52.7 CM	

(2) Body cavities :

Pleural	9 C.C. Serosanguinous
Peritoneal	90 C.C. Serosanguinous

(3) Cardiovascular system :

Greater vascular structures	Gross	Microscopic Diagnosis
	No remarkable finding	No pathological diagnosis

Heart				
General	Size	4.3 x 3.8 x 3.4 CM	Weight	30.8 GM
Gross	No remarkable finding			
Ventricle	Right	Size	4.1 x 2.7 x 2.0 CM	
		Wall thickness	0.4 CM	
	Left	Size	3.9 x 2.8 x 2.0 CM	
		Wall thickness	1.5 CM	

Valves			
Gross	No remarkable finding		
Tricuspid valve	3.2 CM in circumference	Pulmonary valve	2.1 CM in circumference
Mitral valve	2.3CM in circumference	Aortic valve	1.3 CM

Cardiovascular system	Gross	Microscopic Diagnosis
Epicardium	No remarkable finding	No pathological diagnosis
Myocardium	No remarkable finding	A myocardial cell with prominent eosinophilic intranuclear inclusion body is seen.
Endocardium	No remarkable finding	No pathological diagnosis
Coronary arteries	No remarkable finding	

(4) Respiratory system :

Trachea and major bronchi			
Contents	No	Mucosa	Intact

Lung					
Right	Size	9.6 x 5.7 x 5.3 CM	Left	Size	10.0 x 7.8 x 4.0 CM
	Weight	74.6 GM		Weight	58.5 GM
Gross	Grossly unremarkable				
Microscopic Diagnosis	Pneumocytes with prominent eosinophilic intranuclear inclusions are seen. Scant chronic inflammatory infiltrates are notes. There was also extensive hyaline membrane formation. Foci of calcifications and organized thrombi are seen in arterioles focally.				

Mediastinum／Thymus				
Gross	Size	3.1 x 2.1 x 0.4 CM	Weight	2.64 GM
	Grossly small in size			
Microscopic Diagnosis	The thymus consists of predominantly epithelial cells. Almost no lymphocytes are seen. There are also many virocytes with basophilic intracytoplasmic inclusions, enlarged nuclei and prominent eosinophilic nuclear inclusions.			

(5) Gastrointestinal Tract :

Gastrointestinal Tract	Gross	Microscopic Diagnosis
Pharynx	No grossly remarkable finding	
Esophagus	9.5 CM long and 2.1 CM in diameter	No pathological diagnosis
	No grossly remarkable finding	

Stomach				
Gross	No remarkable finding			
	Greater curvature	9.1 CM	Lesser curvature	4.4 CM
Microscopic Diagnosis	The stomach shows autolysis and apoptotic bodies are identified in glands A remarkable number of glandular cells show enlarged nuclei and prominent eosinophilic nuclear inclusions. Depletion of lymphocyte and inflammatory cells are also noted.			

Small bowel	
Gross	124.3 cm in length and 3.1 cm in circumference
	Minimal circumference : 1.3cm
Microscopic Diagnosis	Blunted villi, lack of Peyer's patches and lymphocytes are notes. Also seen are numerous virocytes with prominent intranuclear inclusions.

Large bowel	
Gross	27.6 cm in length
Microscopic Diagnosis	Numerous virocytes are identified. Lymphocytic infiltrates and scattered eosinophils are found focally. Foci of muscular necrosis and scattered virus infected smooth muscle cells are also noted.

Cecum and appendix : Appendix	
Gross	1.3 cm in length and 0.4 cm in circumference
	No grossly remarkable finding
Microscopic Diagnosis	Autolysis and virocytes in appendiceal mucosa.

Pancreas				
Gross	Size	7.4 x 1.8 x 1.3 CM	Weight	11.8 GM
Microscopic Diagnosis	Autolysis			

(6) Hepatobiliary system :

Liver		
Gross	Weight	2670 GM
	Size	13.0 x 8.5 x 4.2 CM
	Out surface	Smooth
	Cut surface	Grossly patchy yellow areas
Microscopic Diagnosis	Virocytes with enlarged nuclei and prominent eosinophilic intranuclear inclusion are identified in the bile duct epithelium. The liver shows extensive hemorrhagic central lobular necrosis.	

Gallbladder, Bile ducts	
Gross	4.5 x 1.72 x 1.2 CM
	Wall : 0.1 cm in thickness
Microscopic Diagnosis	Autolysis and bile sludge

(7) Hematopoietic-Lymphoid system :

Spleen				
Gross	Weight	28.6 GM	Size	6.1 x 4.5 x 1.8 CM
	Congestion			
Microscopic Diagnosis	Necrosis			

Bone marrow	
Gross	No grossly remarkable finding
Microscopic Diagnosis	No remarkable pathological diagnosis

(8) Urogenital system :

Kidneys					
Right	Size	5.4 x 3.2 x 2.0 CM	Left	Size	5.4 x 2.8 x 2.5 CM
	Weight	22.3 GM		Weight	25.1 GM
	Cortex	0.3 CM		Cortex	0.3 CM
Gross	No grossly remarkable finding				
Microscopic Diagnosis	Hemosiderin deposition in renal tubular epithelium. Numerous virocytes with prominent eosinophilic intranuclear inclusions in bilateral kidney.				

Bladder and urethra : Bladder		
Size	2.7 x 2.5 x 1.2 CM	
Bladder and urethra : Ureter		
Size	Right	7.2 cm in length and 0.3 cm in diameter
	Left	6.8 cm in length and 0.3 cm in diameter
Gross	No grossly remarkable finding	

Genital organs : Ovaries and fallopian tubes				
Location	abdomen	Size	Right	2.0 x 1.6 x 0.6 CM
			Left	2.5 x 1.0 x 0.8 CM
Gross	No grossly remarkable finding			
Microscopic Diagnosis	The bilateral ovaries show extensive necrosis and ghost cells with enlarged nuclei.			

(9) Endocrine system :

Thyroid				
Gross	Weight	1.3 GM	Size	3.6 x 0.8 x 0.8 CM
	No grossly remarkable finding			
Microscopic Diagnosis	Some follicular cells show enlarged nuclei and prominent eosinophilic intranuclear inclusions.			

Adrenals glands					
Right	Size	4.3 x 2.3 x 1.4 CM	Left	Size	4.5 x 2.1 x 2.0 CM
	Weight	3.4 GM		Weight	3.8 GM
Gross	No grossly remarkable finding				
Microscopic Diagnosis	No remarkable pathological diagnosis				

Pituitary and Pineal	
Gross	No grossly remarkable finding

(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, astrocytosis or acute ischemic change is noted.	

Central nervous system : Brain		
Gross	Weight	531 GM (weight with cerebellum)
	Shape	Symmetrical
	Greenish discoloration at the bilateral cortex near the major sulcus.	
Microscopic Diagnosis	Focal ischemic neuronal necrosis (slide B5) and mild meningitis. No virocytes is identified.	

Central nervous system	Gross	Central nervous system	Gross
Scalp	Unremarkable	Falx	Unremarkable
Dura	Unremarkable	CSF	Unremarkable
Tentorium	Unremarkable	Leptomeninges	Unremarkable
Cranial nerves	Unremarkable	Circle of Willis	Unremarkable
Spinal cord	Unremarkable		

Section Taken and Labeled as :

Labeled	Section Taken	Labeled	Section Taken
THYM	Thymus	RA	Right atrium, heart
BM	Bone marrow (rib and vertebra)	LA	Left atrium, heart
RAD	Right adrenal gland	RV	Right ventricle, heart
LAD	Left adrenal gland	LV	Left ventricle, heart
SPL 1-2	Spleen	RK 1-2	Right kidney
GB	Gallbladder	LK 1-2	Left kidney
APP	Appendix	UB	Urinary bladder
PAN 1-3	Pancreas	RO	Right ovary
AMP	Ampulla of vater	LO	Left ovary
L 1-8	Live (numbers correspond to hepatic segment)		
STO 1-3	Stomach (STO2 : pyloric ring)		
ESO 1-3	Esophagus	RUL 1-2	Right upper lobe, lung
SBL 1-7	Small intestine	RML 1-2	Right midle lobe, lung
LBL 1-3	Large intestine	RLL 1-2	Right lower lobe, lung
RTH	Right thyroid gland	LUL 1-2	Left upper lobe, lung
LTH	Left thyroid gland	LLL 1-2	Left lower lobe, lung
B1	Parasagittal cortex, right	B4	Corpus callosum, left
B2	Parasagittal cortex, left	B11	Corpus callosum (bilateral)
B3	Corpus callosum, right	B12	Midbrain
B5, B7	Temporal lobe and hippocampus, right		
B6, B8	Temporal lobe and hippocampus, left		
B9	Hypothalamus, basal ganglia and insular cortex, right		
B10	Hypothalamus, basal ganglia and insular cortex, left		
B 13-18			
UT, PAR, SK			