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A Case with Hepatic Hemangioma, Duplicated and Horseshoe Kidney Detected by The Reconstruction of Three-Dimensional Computed Tomography (3D-CT)

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Abstract

Authors have reported several research on the reconstruction of three-dimensional computed tomography (3D-CT) by Synapse Vincent, Japan. The patient was an 87-year-old female with abdominal discomfort. Abdominal CT and 3D-CT images have suggested the presence of hepatic cysts and hemangioma, as well as duplicated and horseshoe kidney. Current disease seems to be the inherited disease, and it is involved in the Congenital Anomalies of the Kidney and the Urinary Tract (CAKUT). Consequently, reconstruction of 3D-CT seems to be beneficial and useful for diagnosing, clinical practice, and research. Further development of artificial intelligence (AI) technique will be expected in the future.

Keywords

Three-Dimensional Computed Tomography, Synapse Vincent, Duplicated Kidney, Horseshoe Kidney, Congenital Anomalies of the Kidney and The Urinary Tract

Abbreviations

3D-CT: Three-Dimensional Computed Tomography; CAKUT: Congenital Anomalies of the Kidney and The Urinary Tract

Introduction

The development of three-dimensional computed tomography (3D-CT) has been found in the developed countries [1,2]. By the application of Artificial Intelligence (AI), further achievement of detail images can be obtained [3,4]. Several kinds of 3D-CT have been applied in the medical practice [5]. Among them, actually expression of minute blood vessels can be observed for more precise degree [6].

Authors and collaborators have various experiences for patients with the application of radiological evaluation. For examining the detail morphological situation, the reconstruction of 3D-CT using Synapse Vincent, Japan has been used [7]. We have reported benefits of Synapse Vincent, and also meaningful cases

from radiological point of view [8,9]. Recently, we have encountered an impressive case who was an elderly female with abdominal discomfort. She underwent detail evaluation of reconstruction of 3D-CT, and her general clinical course with perspectives are discussed in this article.

Case Presentation

History & Physicals:

The patient was an 87-year-old woman. She had been suffering from hypertension, anxiety neurosis, right shoulder arthritis, and overactive bladder (OAB) for about 8 years. She recently developed abdominal discomfort, where it was not located in the center of the abdomen, but rather in the left and right flanks. The pain was not related to meals or time of day, did not move or radiate, with no fever or other symptoms. Physical examination revealed vital signs of a blood pressure of 36.5°C, blood pressure of 133/64 mmHg, pulse rate of 74 /min, and SpO_2 of 98%. There were no abnormalities in speech, consciousness, head, neck, or chest. The abdomen was flat and soft, and bowel sounds were normal. Palpation and auscultation of the abdomen extensively revealed no abnormalities, and no tenderness or defensiveness was noted.

CT Scan and 3D-CT Reconstruction:

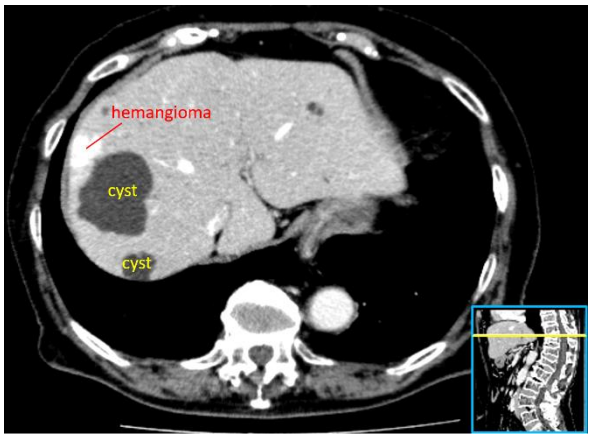

Fig-1: Abdominal CT Scan (contrasted)

Hepatic cysts are observed in the right lobe. Hemangioma can be found nearby the cyst. Osteoporosis is present in the vertebrae.

Abdominal CT and contrasted CT revealed hepatic cysts in the right lobe of the liver. A space-occupying lesion (SOL) nearby was diagnosed as a hemangioma (**Fig-1**). Gallstones were present in the gallbladder, and there were no particular changes in the pancreas. The kidneys were within the normal range in overall size. No enlargement of the para-aortic lymph nodes was observed.

By the application of Synapse Vincent, several images of 3D-CT have been synthesized as satisfactory quality. These reconstructed images are described here with some explanations in the followings (**Fig-2** to **Fig-6**).

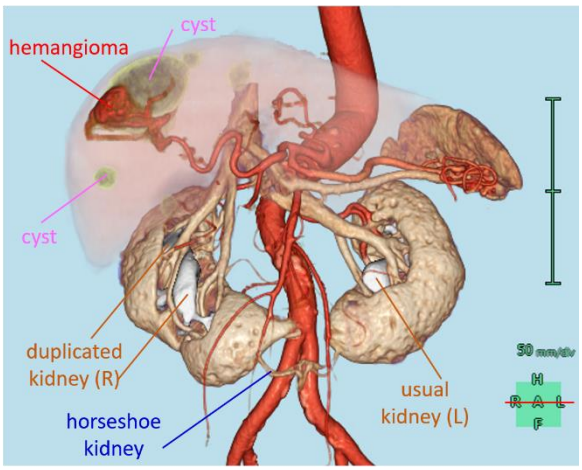

Fig-2: Reconstruction of CT (upright)

Right duplicated kidney has two renal pelvis. Horseshoe kidney has common blood vessel. The blood vessel combines bilateral kidneys.

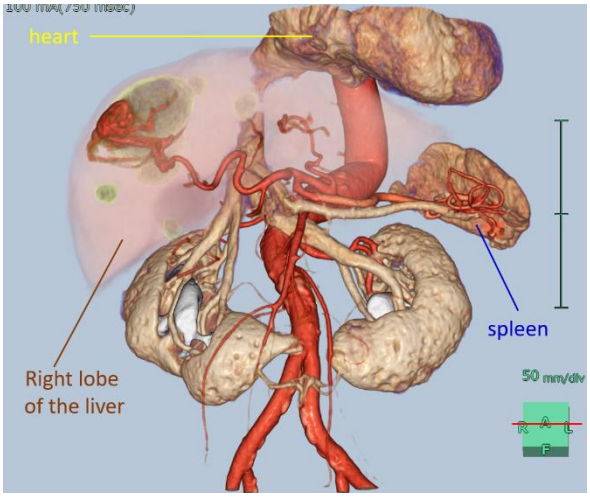

Fig-3: Reconstruction of CT (near upright)

It shows the position of cyst and hemangioma. Some small hepatic cysts are seen in the liver. Cysts can be observed as transparent images.

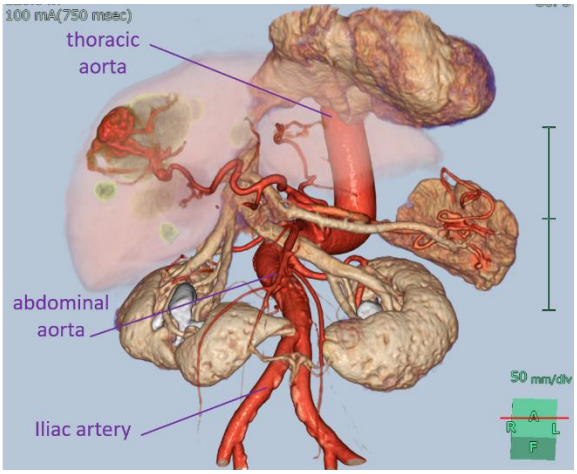

Fig-4: Reconstruction of CT (oblique)

It shows the oblique angle of frontal view. It shows heart, aorta and iliac arteries. Duplicated and horseshoe kidneys are found.

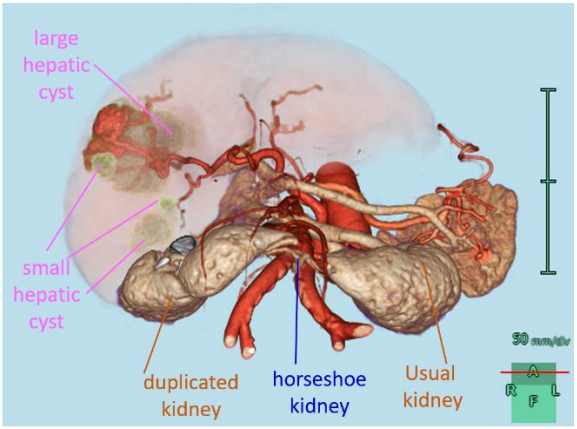

Fig-5: Reconstruction of CT (lower)

It can detect the lower aspects of kidneys. Several images of hepatic cysts are detected. Some blood vessels from aorta are observed.

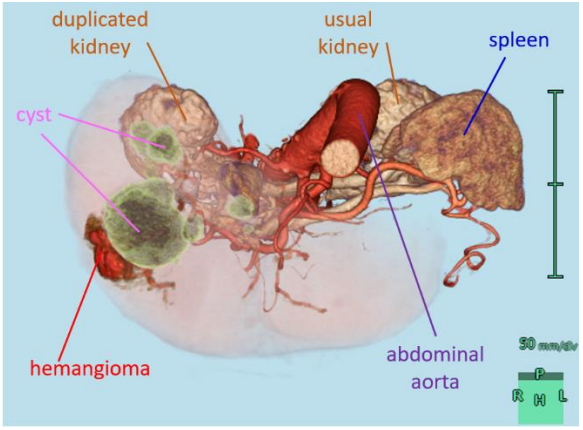

Fig-6: Reconstruction of CT (bottom)

It shows the bottom image of liver and kidneys. Large hepatic cyst is lower than hemangioma. Hemangioma exists nearby the liver surface.

Discussion

In this report, it was rather difficult to detect the cause of abdominal discomfort. Using 3D-CT reconstruction can bring the diagnosis [10]. A notable feature included the presence of hepatic cysts and hemangioma in the liver, located close to each other. The presence of incomplete duplicated kidney was shown in the right kidney.

Duplicated kidney refers to the duplication of the renal pelvis and ureter in one kidney. It is included in the Congenital Anomalies of the Kidney and the Urinary Tract (CAKUT), with complete and incomplete types [11]. For either type, duplicated kidney can affect renal function and cause complications. They include abdominal pain and urinary tract infections, so early diagnosis and effective management are important [12]. Duplicated kidney or ureteral duplication has been incidentally diagnosed. A female case was reported with left-sided chronic low-back pain [13]. An elderly female was found to have a duplicated renal pelvis and ureter [14]. When imaging studies show dilated renal pelvis, it could be due to a stone, malignant tumor, or other downstream obstruction. After investigating the cause, it was determined that her renal pelvis was not obstructed, but rather due to a congenital anomaly.

The horseshoe kidney (HK) has been rarely observed in clinical practice. It usually designates a transposition with combination of parenchyma of bilateral kidneys [15]. Furthermore, the case with common blood vessel present between bilateral kidneys is also included despite less common parenchyma volume [16]. In latest report, horseshoe kidney was described by practical application of Synapse Vincent Software Package (SVSP) [17]. The horseshoe kidney may develop some clinical complications such as ureteropelvic junction obstruction [18]. Consequently, it seems to be important to clarify the anatomical and physiological situation of horseshoe kidney by SVSP.

In summary, 87-year-old female developed abdominal discomfort, and further evaluation brought the diagnoses of hepatic cysts, hemangioma, duplicated and horseshoe kidney by the application of reconstruction of 3D-CT. The reconstruction of 3D-CT

would be beneficial for clinical practice and research, and further development of this technique will be expected in the future.

Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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