Hepatic Blood Volume Imaging Within Catheter Labs
Supported by *syngo* DynaPBV Body

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Patient history

A 70-year-old male with a 16-year history of type-B hepatitis and cirrhosis presented with symptoms of easy fatigability and anorexia for more than two months.

Diagnosis

Regular upper abdominal CT scan found a space-occupying lesion of about 3.3 x 2.9 cm in the right posterior lobe of the liver. The lesion showed early enhancement in the arterial phase and early wash-out in the venous phase, which is a imaging sign of hepatocellular carcinoma (HCC) (fig. 1). There was no abnormal increase in alfa-fetoprotein (AFP) level.
Multi-slice CT perfusion was carried out with intravenous injection three days before the transcatheter arterial chemoembolization (TACE) procedure. Image post-processing was performed with *syngo* volume perfusion CT Body. *syngo* DynaPBV Body acquisition was performed in the interventional suite right before the TACE procedure.
The catheter tip for the injection was located at proper hepatic artery. The *syngo* DynaPBV Body acquisition protocol is a 5s DSA protocol. The data is automatically reconstructed and visualized as color-coded blood volume map.

Treatment

The blood volume (BV) map of CT perfusion showed a highly perfused round-shaped lesion in the right posterior lobe of the liver (fig. 2). The *syngo* DynaPBV map displayed a similar appearance (fig. 3 and 4). The BV value of the tumor spots and normal liver parenchyma sites were measured with both imaging methods. For this case, the BV of the tumor spots were 176.4 cc/1000 cc and 323.3 cc/1000 cc, the BV of normal liver parenchyma were 111.1 cc/1000 cc and 24.1 cc/1000 cc for CT perfusion and *syngo* DynaPBV Body respectively. The BV value with the *syngo* DynaPBV Body seems to be higher than that with perfusion CT. Possible reasons for this phenomenon might be the different injection protocols and different algorithms which were applied in these two methods.

Intra-arterial liver *syngo* DynaPBV Body examination protocol

Imaging protocol	5s DSA
Contrast quantity	36 cc (370 mg/cc) diluted to 25 %
Injection rate	3 cc/sec
Injection duration	12 sec
X-ray delay	7 sec
Injection site	Proper hepatic artery
Reconstruction preset	DynaPBV-Body

Comments

syngo DynaPBV Body for liver was proved clinically feasible in this case. The BV maps of the two different methods were visually comparable. Because of the different injection protocols, the BV value of CT perfusion represents the total blood volume from both hepatic artery and portal vein, while the qualitative BV measurement gained with the prototype software for performing flat panel blood volume measurements, only indicates the blood volume from pure arterial perfusion. To make the comparison more precise, we assumed that $CT\text{-}PBV_{arterial}$ = CT-PBV x HPI in the further study[2]. The HPI (hepatic perfusion index) represents the proportion of hepatic arterial perfusion out of the total perfusion. The initial result of this study showed although the qualitative BV measurement of *syngo* DynaPBV Body, is higher than CT perfusion, a good correlation between the BV values from the two different methods was achieved[2].
Furthermore, *syngo* DynaPBV Body may enhance small tumor (diameter 0.5 -1.0 cm) detection rate, which could affect the strategy of the procedure so as to optimize management of HCC diagnosis and treatment in future studies.

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[2] Zhuang Z, Ye H, Beilner J, et al. Hepatic Blood Volume Imaging Using Flat Detector CT in Comparison to Conventional Multislice CT Perfusion: A Pilot Study in Patients with Hepatocellular Carcinoma. 2012; RSNA.

From left to right: Dr. Chi Jiachang, Dr. Zhuang Zhiguo, Prof. Xu Jianrong, and Dr. Zhang Xuebin.

"Until now, we compared the blood volume of pre-procedural *syngo* DynaPBV Body with CT perfusion. The initial results showed a very good correlation between them. In the next step, we want to do the *syngo* DynaPBV Body in liver cancer before and right after TACE to assess the effect of the procedure, making an optimal end point for embolization."

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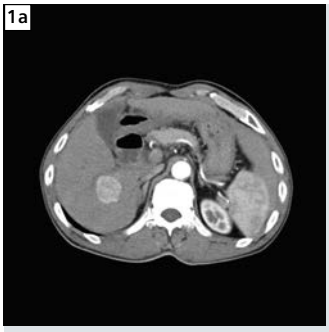

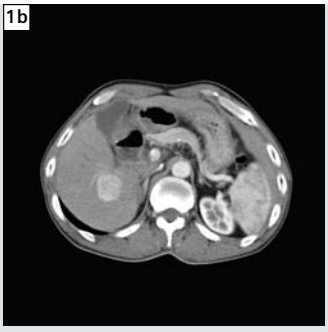

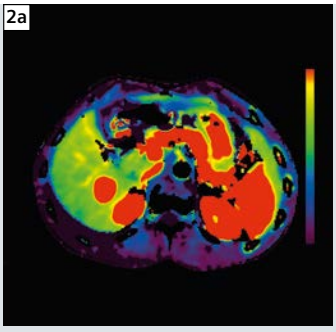

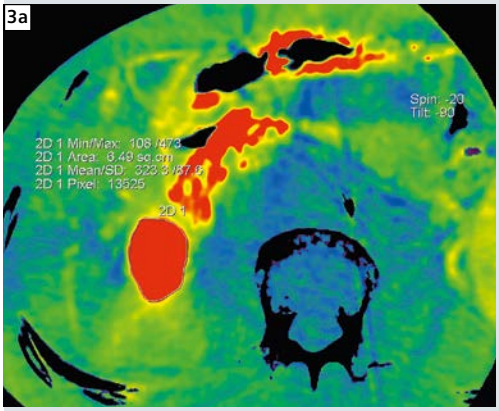

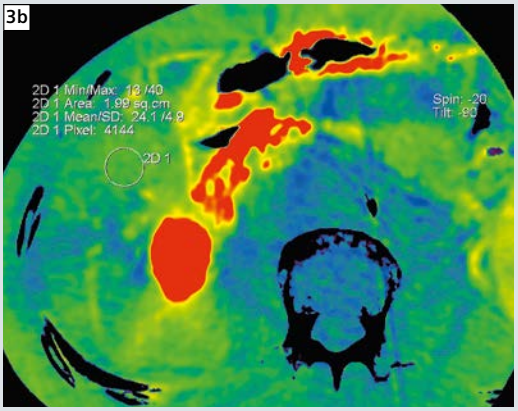

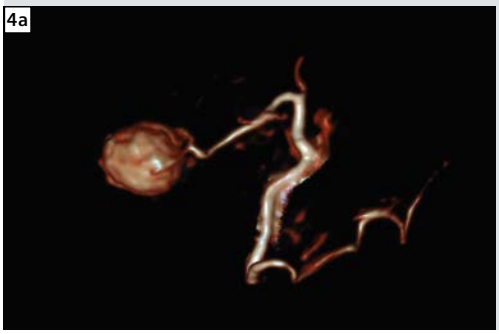

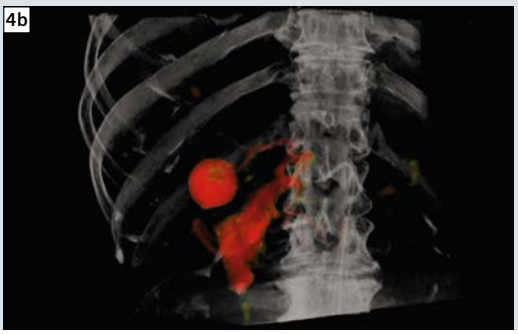

1 Multiphase CT scan:
[a] Arterial phase
[b] portal vein phase

2 [a] CT perfusion image.
[b] Values of the perfusion parameters from CT perfusion.

3 Qualitative blood volume measurement (prototype software)
[a] of the tumor
[b] of the liver parenchyma.

4 [a] Image of tumor and its feeding artery in VRT mode.
[b] Fusion of bone structure and blood-perfused tumor in VRT mode.