

# Epinephrine (Pharmaco-CTHA) :

CT  
1

가 : CT 가 가  
 가 : 가 CT 가  
 22 : 가 CT 가  
 1 0.3cc/sec 8cc 5  
 CT , 2 10 µg normal saline 10cc  
 1 0.3cc/sec 8cc  
 11 CT , 3 CT(conven-  
 tional CTHA) 1cc/sec 25cc 5 CT  
 , 3) 가 CT 1) 가 , 2) 가  
 4)  
 : 22 CT  
 가 12  
 1 , 2 3 가 5 , 4 1 가 CT  
 16 가 . 가 1, 2 3 9, 13 49 가  
 2 3 가 (p=.000). 1  
 가 9 가 가 8 2 (4 ) 3  
 (2 ) 2, 4 가 . 3 4 가  
 1 1 2 . 16 “  
 (good) ” “ (excellent) ” 1 4 (25.0%), 2 10  
 (62.5%), 3 13 (81.3%)  
 : CT(Pharmaco-CTHA)  
 가

CT(liver spiral CT during hepatic arteri-  
 ography : CTHA) , (pharmacoangiography)  
 CT (4-7), SPECT(single photon emission computed tomog-  
 (1-3). raphy)  
 가 (8)



가 12 가  
 1, 2 3 가 5, 4 1  
 가 4, 5  
 CT 16 ( 0.73  
 )가  
 CTHA  
 CT 가 1, 2, 3  
 9, 13, 49 가 2 Pharmaco-  
 CTHA가 3 conventional CTHA 가  
 (Post Hoc tests, p= .000)  
 (Fig. 2, 3). 3 conven-  
 tional CTHA 1/3 1 가  
 9 가 가  
 2 3 2, 4 가 3  
 가 (Chi-square tests,  
 p=.022) (Table 2, 3). 가 2 4, 3  
 2 가 2  
 (p= .365).  
 3 conventional CTHA 4  
 (4/22 = 18.2%)가 1/3 1  
 1 (1/22 = 4.5%), 2 Pharmaco-C-  
 THA (Fig. 4).  
 “ ” “ ”

CT 16 1, 2  
 3 8, 12 14 가 , 1  
 “ ” 4 (25.0%) “ , ”가 4 (25.0%)  
 , 2 (Pharmaco-CTHA) “ ” 2  
 (12.5%) “ , ”가 10 (62.5%)가 1 “

Table 2. Results of Comparison of 3 Different CTHA

	Method 1 CTHA	Method 2 CTHA	Method 3 CTHA
False positive			
Around the GB	0	0	3
Except around the GB	9	13	46
False negative	8	4	2
Portal effect	1	0	4

Table 3. Statistical Analysis of Each Item

	† False positive	‡ False negative
Method 1 vs. Method 2	p= 0.879	p= 0.144
vs. Method 3	p= 0.000	p= 0.022
Method 2 vs. Method 1	p= 0.879	p= 0.144
vs. Method 3	p= 0.000	p= 0.365
Method 3 vs. Method 1	p= 0.000	p= 0.022
vs. Method 2	p= 0.000	p= 0.365

\*The mean difference is significant at the 0.05 level.

† Post HOC test (SPSS, version 8.0) was applied.

‡ Chi-square test was applied.

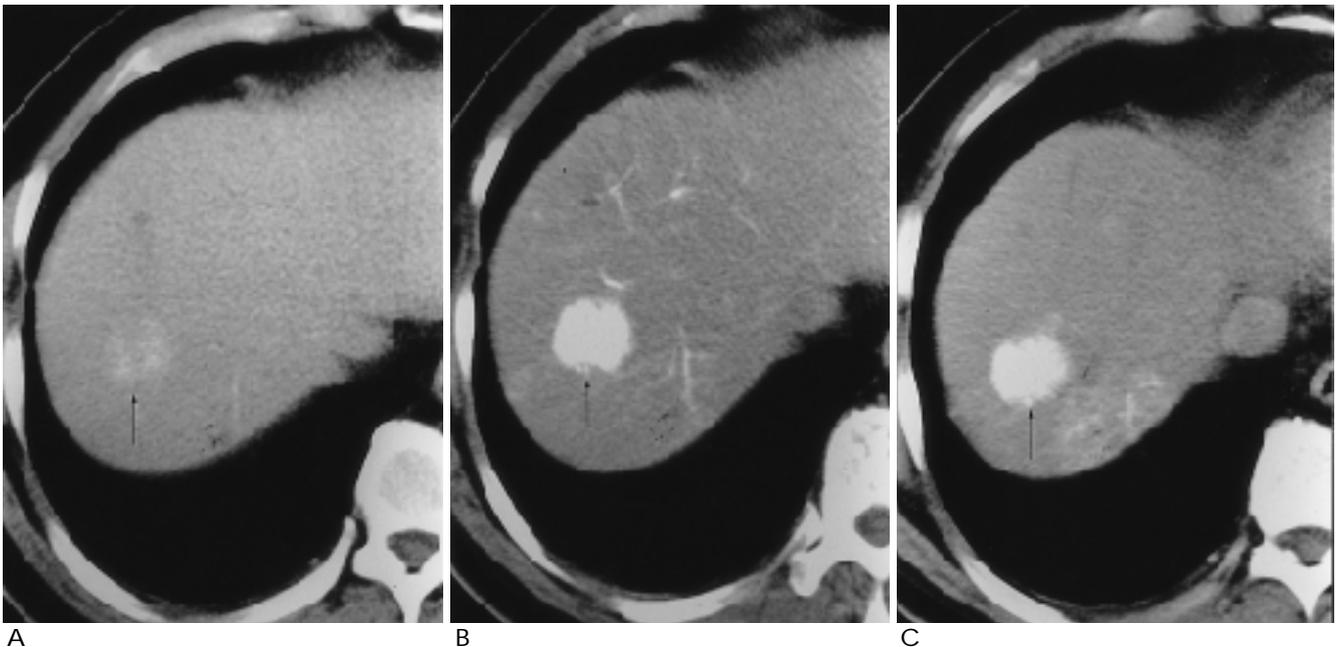


Fig. 1. The conspicuity of the lesion in a 54-year-old man. A. On the first method poorly defined slightly enhancing lesion is graded “ poor ” (arrow). B. On the second method (Pharmaco-CTHA) this lesion is well defined and well enhanced (arrow). So this lesion is graded “ excellent ”. C. On the third method (conventional CTHA) this lesion is also graded “ excellent ” (arrow).

가 (Chi-square tests,  $p=0.033$ ). 3 (conventional CTHA) “ ” (p = .238) (Table 4).  
 1 (6.3%) “ 가 13 (81.3%)가 1 Pharmaco-CTHA  
 1 “ 가  
 (Chi-square tests,  $p=0.001$ ). 2 3

Table 4. Conspicuity of the 16 Lesion

	Method 1 CTHA	Method 2 CTHA	Method 3 CTHA
Poor	4 (25.0%)	2 (12.5%)	1 (6.3%)
Good	3 (18.8%)	5 (31.3%)	3 (18.8%)
Excellent	1 (6.3%)	5 (31.3%)	10 (62.5%)

75%

, 25%

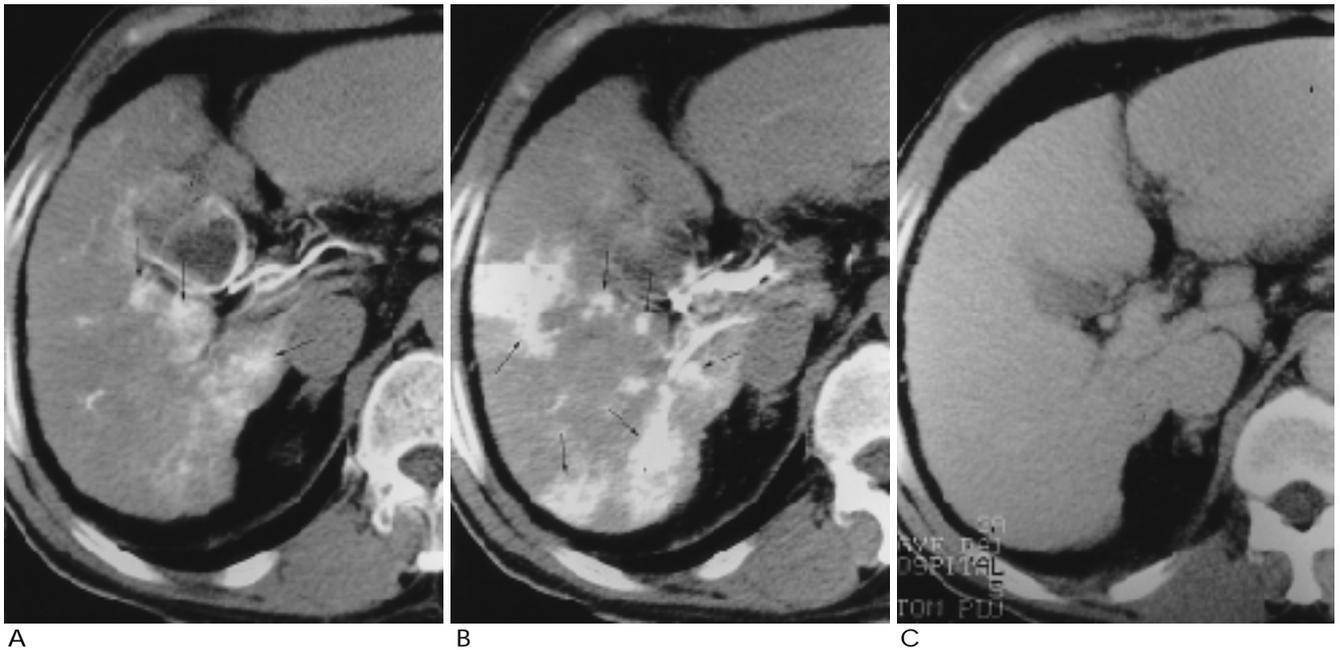


Fig. 2. 46-year-old man underwent CTHA for the sixth chemoembolization.

A. Pharmaco-CTHA shows poorly defined enhancing lesions (arrows). B. Conventional-CTHA shows increased number of poorly defined enhancing lesions (arrows), as compared with A-C. Follow-up lipiodol CT scan shows no lipiodol uptake. Enhancing lesions on both Pharmaco-CTHA and conventional CTHA reveals false positive lesion probably due to arterioportal shunt because of repeated chemoembolization. These false positive lesions are decreased on the Pharmaco-CTHA

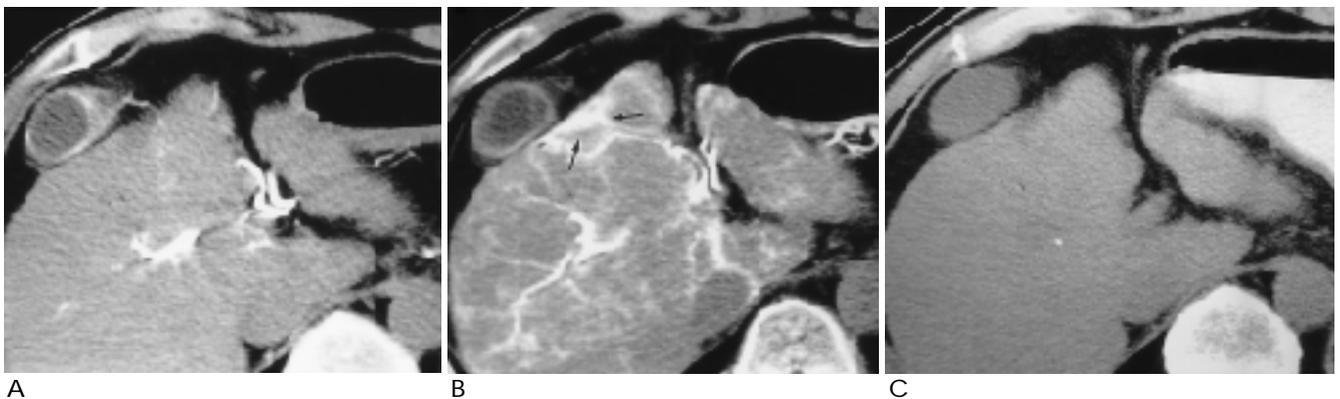


Fig. 3. False positive lesion in a 59-year-old man.

A. Pharmaco-CTHA does not show any perfusion abnormality. B. Conventional CTHA shows a focal area of hyperattenuation in the liver around the gallbladder (arrow). C. Follow-up lipiodol CT also no lipiodol uptake around the gallbladder.

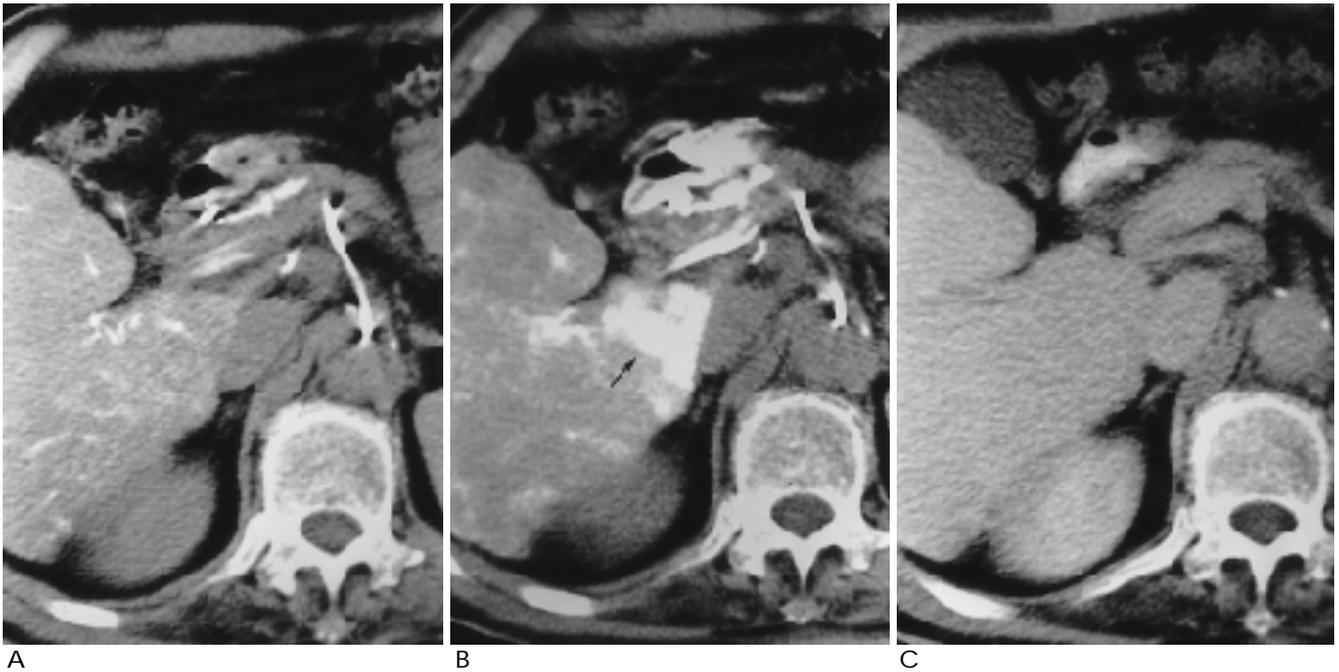


Fig. 4. False positive lesion probably due to portal effect in a 56-year-old man. A. Pharmaco-CTHA does not show any perfusion abnormality. B. Conventional CTHA shows a focal enhancing lesion in the caudate lobe of the liver (arrow). C. Follow-up lipidol CT also no lipidol uptake.

(11-13). CTHA , 가  
 70%  
 CT (7). CTHA  
 Pharmaco-CTHA  
 가  
 CT 가  
 CTHA Paul (16)  
 가 (14) 5-30 µg  
 , James (8) SPECT 5-50  
 I , IV , 10 µg 5-30 µg  
 , 가 (15). Paul (16)  
 가 25%  
 가 2 가 15  
 가  
 (4-7). James tech- 1/3-1/4 con-  
 netium-99m-labeled macroaggregated albumin ventional CTHA 1cc 25cc  
 SPECT(single photon emission computed tomography) 1/3 0.3cc 8cc  
 1.7-18.7( 4.8) (15) conventional CTHA 가  
 (tumor-to-normal-liver ra- , I , IV , , , ,  
 tio of the radioisotope uptake)가 1.1- , 가  
 53.6 ( 7.1 )가 가 (8), Leif  
 Ekelund , 가  
 (pharmacoangiogram) , , , 가

가  
 Pharmaco-CTHA 가  
 . Pharmaco-CTHA가 conventional CTHA  
 가 가  
 가 가  
 가 Pharmaco-CTHA가 conventional  
 CTHA 가  
 Pharmaco-CTHA CTHA  
 conventional CTHA  
 1/3 CTHA 1  
 conventional CTHA  
 가 가  
 CTHA (Pharmaco-  
 CTHA (conventional CTHA)  
 conventional CTHA  
 가 가 가

1. Ulsonomiya T, Matsumata T, Adachi E, Honda H, Sugimachi K. Limitation of current preoperative liver imaging techniques for intrahepatic metastatic nodules of the hepatocellular carcinoma. *Hepatology* 1992;16:694-701
2. Freeny PC, Marks WM. Computed tomographic arteriography of

- the liver. *Radiology* 1983;148:193-197
3. Chezmar JL, Bernardino ME, Kaufman SH, Nelson RC. Combined CT arterial portography and CT hepatic arteriography for evaluation of the hepatic resection candidate. *Radiology* 1993;17:67-74
4. Abrams HL. The response of tumor vessels to epinephrine in man. *Radiology* 1964;82:217-224
5. Rockoff SD, Doppman J, Block JB, Ketcham A. Variable response of tumor vessels to intra-arterial epinephrine. *Invest Radiol* 1966;1:205-213
6. Kaplan JK, Bookstein JJ. Abdominal visceral pharmacoangiography with angiotensin. *Radiology* 1972;103:79-83
7. Ekelund L, Lunderquist A. Pharmacoangiography with angiotensin. *Radiology* 1974;110:533-540
8. James C, Andrews, Suzette C et al. Modulation of liver tumor blood flow with hepatic arterial epinephrine : A SPECT study. *Radiology* 1989;173:645-647
9. Itai Y, Furai S, Ohtomo K, et al. Dynamic CT features of arterioportal shunt in hepatocellular carcinoma. *AJR* 1986;146:723-727
10. Nakayama T, Hiyama Y, Ohnishi K, et al. Arterioportal shunts on dynamic computed tomography. *AJR* 1983;140:953-957
11. Lutt WW, Greenway CV. Conceptual reviews of hepatic vascular bed. *Hepatology* 1987;7:752-963
12. Ohnishi K, Sato S, Tsunoda T. Portal venous hemodynamics in hepatocellular carcinoma, Effects of hepatic artery embolization. *Gastroentology* 1987;93(3):591-596
13. Mathieu D, Vasile N, Dibie C, Grenier P. Portal cavernoma : dynamic CT features and transient difference in hepatic attenuation. *Radiology* 1985;154:743-748
14. . . . . CT, Lipiodol CT  
 1996;35(6):893-898
15. . . . . CT  
 1996;35:373-380
16. Paul C. Jahn, William J. Frates, Robert E. Paul. The epinephrine effect in angiography of gastrointestinal tract tumors. *Radiology* 1967;88:686-690

## **Use of Epinephrine Infusion During CT Hepatic Arteriography (Pharmaco-CTHA) : Clinical Application in Patients with Hepatocellular Carcinoma<sup>1</sup>**

Soong Hee Kim, M.D., Soon Joo Cha, M.D., Jung Hee Yoon, M.D., Young Hwan Kim, M.D.,  
Yong Hoon Kim, M.D., Gham Hur, M.D.

<sup>1</sup>Department of Radiology, Sanggye Paik Hospital, Inje University

**Purpose :** To evaluate the usefulness of epinephrine infusion (Pharmaco-CTHA) prior to liver to liver spiral CT during hepatic arteriography in patients with hepatocellular carcinoma.

**Materials and methods :** Twenty-two patients in whom hepatocellular carcinoma had been diagnosed underwent three types of liver spiral CT during hepatic arteriography. In the first method, spiral CT scanning was started 5 seconds after injecting 8cc of contrast media at a rate of 0.3cc/sec. In the second, 10 µg of epinephrine was slowly injected for 1 minute via the catheter and subsequent spiral CT scanning began 11 seconds after injecting 8cc of contrast media at a rate of 0.3cc/sec. In the third method, spiral CT scanning was started 5 seconds after injecting 25cc of contrast media at a rate of 1cc/sec. The following were evaluated and compared with the results of follow-up lipiodol CT: 1) the incidence of false positive lesions; 2) the incidence of false negative lesions; 3) portal enhancement; and 4) lesion conspicuity.

**Results :** Follow-up lipiodol CT of 22 patients showed 16 masses. In 12 patients there was no lipiodol uptake, and in five, four and one patient(s), uptake occurred once, twice, and three times, respectively. With method 1 there were nine false-positive lesions, with method 2 there were 13, and with method 3, there were 49. The use of method 2(Pharmaco-CTHA) led to less false-positives than did method 3 (conventional CTHA) ( $p= 0.000$ ). Method 1 showed the lowest false positive rate (nine lesions), but its false-negative rate was two and four times higher than with method 2 (four lesions) and with method 3 (two lesions), respectively. Portal enhancement was observed four times using method 3 and once with method 1, but was absent with method 2. As regards the conspicuity of 16 masses, " good "and" excellent "lesions were seen four times with method 1(25%), ten times with method 2 (62.5%) and thirteen times with method 3 (81.3%).

**Conclusion :** The infusion of epinephrine (Pharmaco-CTHA) prior to spiral CT during hepatic arteriography has the advantage of reducing the amount of contrast media required as well as the number of cases which are false positive and show no portal enhancement.

**Index words :** CT, angiography  
Drugs, effects  
Liver neoplasms, CT  
Liver neoplasms, blood supply

Address reprint requests to : Soong Hee Kim, M.D., Department of Radiology, Sanggye Paik Hospital, Inje University  
#761-1 Sanggye-7dong Nowon-gu, Seoul, 139-707, Korea.  
Tel. 82-2-950-1182 Fax. 82-2-950-1220