

Hepatic Cyst versus Hemangioma: Useful T2-FLAIR Image for Differentiation

Thussanee Chanthasittiporn, RT¹; Montree Sirikhunseang, RT¹; Somsak Geraplansub, MD¹; Thanis Saksirinukul, MD¹



Thussanee Chanthasittiporn, RT

Abstract

OBJECTIVE: To study the concordance between diagnosis of hepatic cyst and hepatic hemangioma by using T2-FLAIR and multiphase contrasted MRI liver.

MATERIALS AND METHODS: All cases for MRI liver who were diagnosed to be hepatic cyst and hepatic hemangioma by multiphase contrasted MRI liver and T2-FLAIR images form year 2014 to 2015 at Bangkok Hospital Headquarters, Bangkok, Thailand. The total 106 nodules were reviewed by two experienced radiologists and analyzed the new and previous reports for concordance and interpretation of the results.

RESULTS: The new reports from T2-FLAIR images compared with report from contrasted MRI liver. The findings of the concordance to be hemangioma are 73 nodules and hepatic cysts for 32 nodules. There is only one nodule which is not corresponding. Hence, the concordance of these two studies is 99.05%.

CONCLUSION: By using T2-FLAIR and contrasted MRI liver to differentiate of hepatic cysts and hemangioma, resulted in concordance of reading is 99.05%.

Keywords: T2-FLAIR, hepatic cyst, hemangioma, MRI liver, multiphase contrasted MRI liver

¹ Imaging Center, Bangkok Hospital, Bangkok, Thailand

* Address Correspondence to author:
Thussanee Chanthasittiporn, RT
Imaging Center, Bangkok Hospital
2 Soi Soonvijai 7, New Petchburi Rd.,
Bangkok 10310, Thailand.
email: thussanee_panpion@yahoo.com

The first two common benign hepatic nodules are hepatic cyst and hepatic hemangioma.^{1,2} By nature, hepatic cyst contains fluid with protein but hepatic hemangioma contains vascular structures with tortuous and variation in sizes. Most of these conditions are free of symptom, except for some occasions; hemangioma may occur rupture causing internal hemorrhage. Hence, the correct diagnosis at the initial non-invasive study is leading to properly follow up and for treatment planning before complication occurrence.

Nowadays, standard protocol of magnetic resonance imaging (MRI) liver composes of T2-weighted (T2W) and T2W images with long TE (echo time)^{3,4} routinely, which can differentiate the hepatic cyst and hemangioma. Hepatic cyst demonstrates bright signal as cerebrospinal fluid (CSF) on both T2W and T2W long TE images. There is rather signal drop of the hepatic hemangioma on the long TE images, but still be brighter signal than splenic signal (Figure 1A-1B).

Sometimes, the small hepatic nodules of these two entities will be difficulty to differentiate based on the non-contrast study as mentioned. Therefore, multiphase contrasted MRI play an important role to make imaging diagnosis. The hepatic cyst shows no enhancement, on the other hand, hepatic hemangioma will be peripheral enhancement, progressive homogeneous enhancement and persistent enhancement on subsequent images (Figure 2A-2B). However, contrasted study of gadolinium may increase risk for contrast allergy and nephrogenic systemic fibrosis (NSF) in the patient of renal function impairment.

We modified the T2-FLAIR image by using fast fluid attenuated inversion recovery (FLAIR) pulse sequences^{5,6} to null signal from the fluid, then the lesion as hepatic cyst will become dark signal (Figure 3A) but in contrast, the lesion of hepatic hemangioma becomes mildly to moderately bright signal (Figure 3B).

Received: November 9, 2016
Revision received: November 11, 2016
Accepted after revision: January 10, 2017
BKK Med J 2017;13(1): 41-44
www.bangkokmedjournal.com

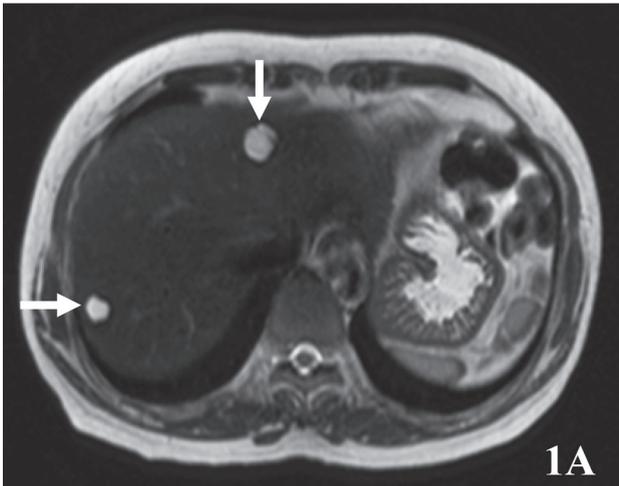


Figure 1A: T2W images with longTE (3T, TR 1146 ms, TE 70 ms) of hepatic cysts reveal small two bright lesions at segment IVa and VIII (see arrows).

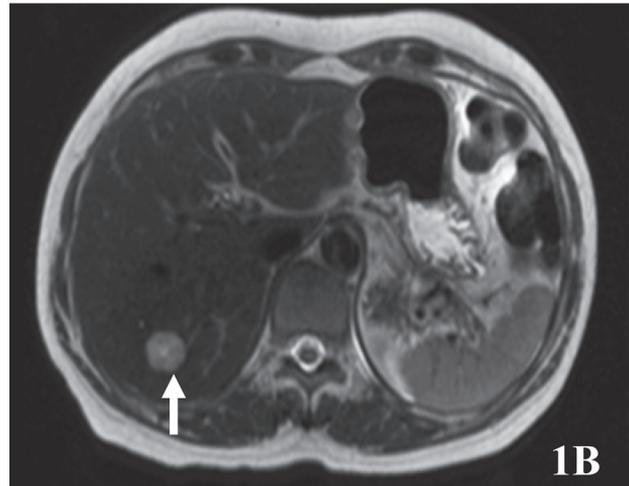


Figure 1B: The lesion at segment VII is less brightness signal than CSF but it appears brighter signal than spleen, indicating of hepatic hemangioma (see arrow).

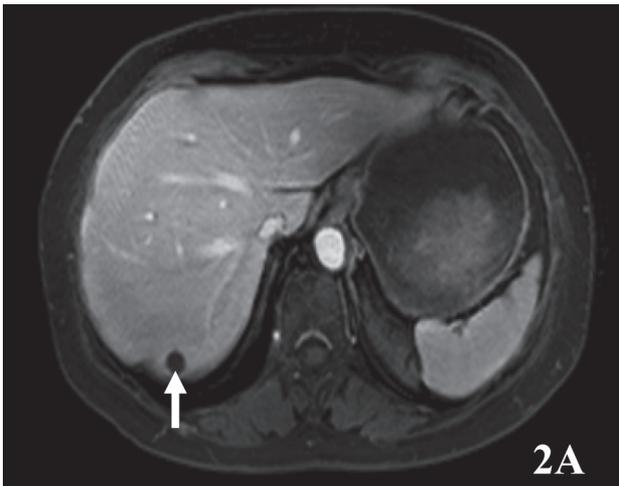


Figure 2A-2B: 2A shows axial post contrasted images (THRIVE sequence, 3T, TR 3.2 ms, TE 1.5 ms) reveal a non-enhancing nodule at segment VII which is representative of hepatic cyst (see arrow) but in case of hemangioma reveals homogeneous enhancement on subsequent images of 2B see arrow.

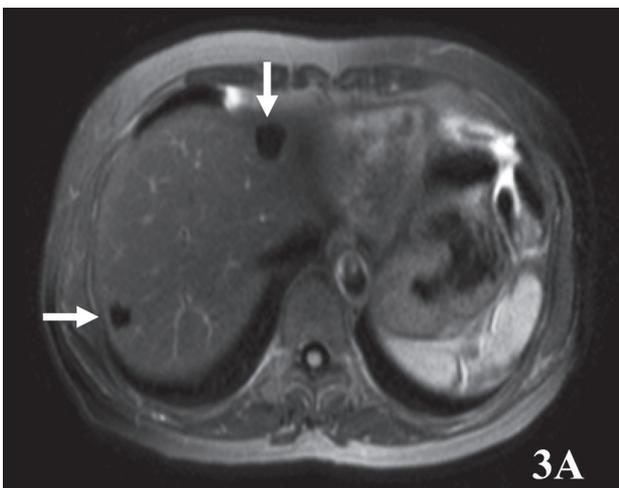
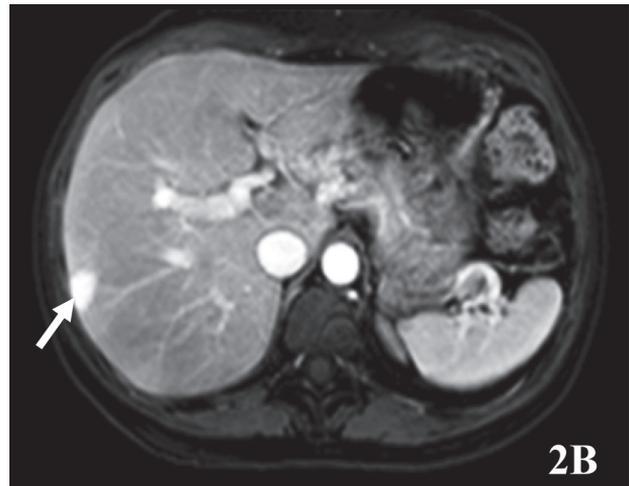
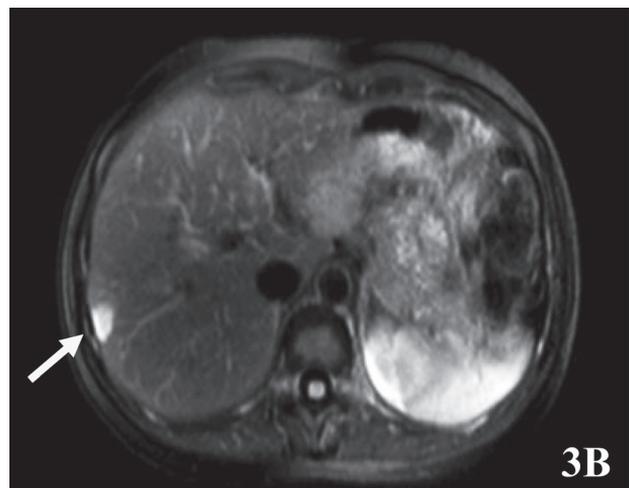


Figure 3A-3B: 3A shows axial T2FLAIR images (3T, TR 1100 ms, TE 105 ms) show two dark lesions at segment II and VII, compatible with hepatic cyst. On the other hand, the subcapsular hemangioma in segment VIII demonstrates bright signal on FLAIR image as seen on 3B (3T, TR 1100 ms, TE 107 ms).



Material and Methods

The study was a retrospective study as follows:

1. All MRI liver studies at Bangkok Hospital Headquarters, Bangkok, Thailand, from 2014 to 2015, composed of multiphase contrasted images and T2-FLAIR images, were recruited. The hepatic nodules from the recruited studies were totally 106 nodules; if were multiple cysts in the same liver, we counted only one cyst, if were both hepatic cysts and hemangioma on the same liver, we counted only hemangioma, if were mixed entities as hepatic cyst, hemangioma with other liver tumor as hepatocellular carcinoma as on our population, we counted only cyst or hemangioma. These counted nodules showed on Table 1.
2. Two experienced radiologists independently read out the nodules as a hepatic cyst or hemangioma based on only T2-FLAIR images, regardless of multiphase contrasted MRI liver or the result of the previous report.
3. All cases were divided into 4 groups and analysis as shown on Table 2 analysis.
 - **Group a:** The result of interpretation of the contrasted MRI study and T2-FLAIR image were agreed to be hemangioma.
 - **Group b:** The result of interpretation of the contrasted MRI study read out as hepatic cyst but the T2-FLAIR image read out as hepatic hemangioma.
 - **Group c:** The result of interpretation of the contrasted MRI study read out as hepatic hemangioma but T2-FLAIR read out as hepatic cyst
 - **Group d:** The result of interpretation of the contrasted MRI study and T2-FLAIR were agreed to be hepatic cyst.
4. Calculated to evaluate the concordance from this formula.⁷

$$\text{Concordance} = \frac{(a+d)}{(a+b+c+d)} \times 100\%$$

Results

The included nodules from the study were 106 ones totally as followings; multiphase contrasted MRI reading out as hemangioma about 73 nodules, and reading out as cyst about 33 ones, T2-FLAIR images reading out as hemangioma about 74 nodules, and reading out as cyst about 32 ones.

Table 1: The 106 counted hepatic nodules from the recruited study.

	Hepatic Cyst	Hepatic Hemangioma
Multiple Cysts	30	
Multiple Hemangiomas		55
Hepatic Cyst+Hepatic Hemangioma		17
Cyst+Hepatoma	3	
Hemangioma+Hepatoma		1
Total	33	73

There was the one nodule being cyst appearance on multiphase contrasted MRI, but showing as hemangioma on T2-FLAIR images (Table 2).

Therefore, the concordance of using multiphase contrasted MRI and T2-FLAIR images for differentiating both two types of nodules was 99.05 percent (Table 3).

Discussion

From a total of 106 nodules, the reading out by both pulse sequences as agreed as 73 nodules for hepatic hemangioma and corresponded to hepatic cyst for 32 nodules. Only one nodule is an abnormal finding, reading out by multiphase contrasted MRI revealed dark signal nodule (Figure 4A) which is likely to be a hepatic cyst but on the T2-FLAIR images demonstrated a rather bright signal nodule, which should be hemangioma (Figure 4B). When this case had been examined by ultrasonic scan, there was a cyst with echoic content, probably due to hemorrhagic cyst.

Motoomi et al.,⁸ have also found the one nodule showing as a cyst on post contrast images, but being a hyperintense FLAIR signal. The nodule represented a hemorrhagic cyst similarly to our study. Katsumi et al.,⁹ and Motoomi et al.,⁸ found the usefulness of FLAIR imaging in hepatic cyst and hepatic hemangioma, furthermore in this present study, the result agreed to the mentioned concept.

The use of T2-FLAIR images to differentiate both entities, between hepatic cyst and hepatic hemangioma, instead of contrasted MRI study alone, is very useful, as the accuracy rate is 99.05%. We recommend this pulse sequence to differentiate hepatic cyst and hemangioma without contrast, or even adding the T2-FLAIR images to routine MRI liver protocol.

Table2: Number of reading out nodules on multiphase contrasted MRI and T2-FLAIR image.

MRI T2/FLAIR	Multiphase contrasted MRI		
	Hemangioma	Cyst	Total
Hemangioma	73	1	74
Cyst	0	32	32
Total	73	33	106

Table3: Analysis of the results : n = (a+b+c+d)

MRI T2/FLAIR	Multiphase contrasted MRI		
	Hemangioma	Cyst	Total
Hemangioma	a	b	(a+b)
Cyst	c	d	(c+d)
Total	(a+c)	(b+d)	(a+b+c+d)

$$\text{Concordance} = \frac{(73+32)}{(73+1+0+32)} \times 100\% = 99.05\%$$

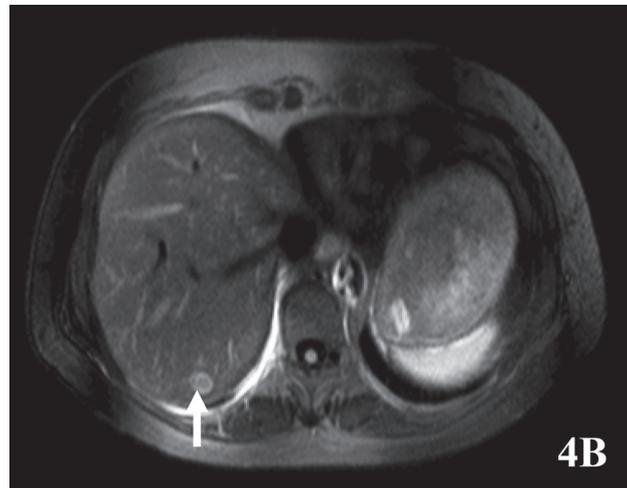
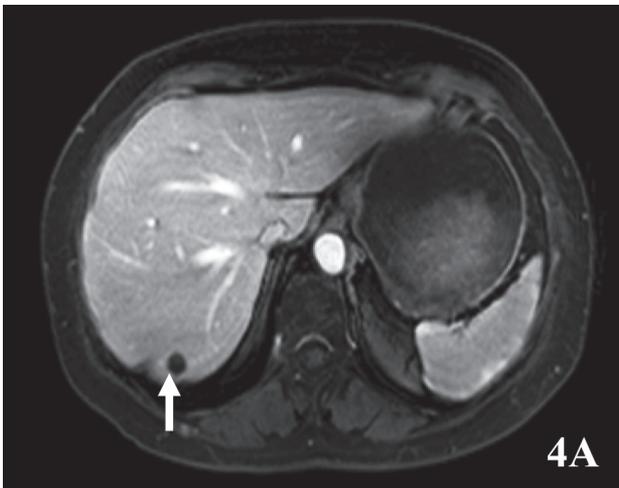


Figure 4A-4B: 4A show axial post contrast images (THRIVE sequence, 3T, TR 3.2 ms, TE 1.5 ms) showed a non-enhancing lesion in segment VII, being mild hyperintense FLAIR (3T,TR 11000,TE 107 ms) signal on 4B, could be a hemorrhagic cyst, and this was confirmed by sonography in Figure 5.

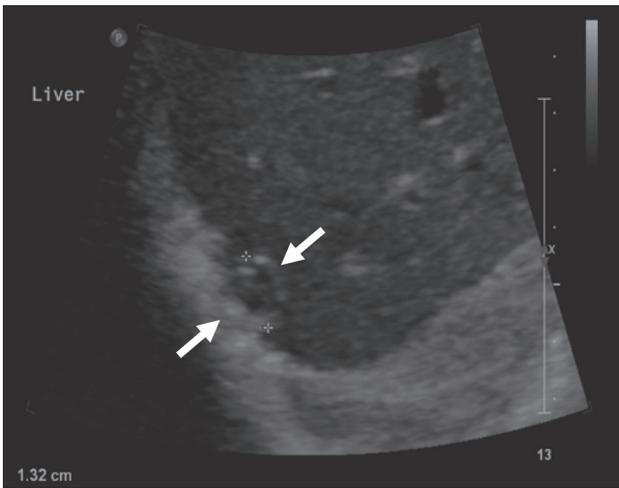


Figure 5: The sonography of the liver showed a subcapsular cyst with echogenic content in right hepatic lobe, and represented hemorrhagic cyst.

The advantages are less cost, time of examination, no other modalities for further examination, no risk to contrast allergy and to patients with renal function impairment. However, the disadvantage of the T2-FLAIR images is seen in the case of an hepatic cyst containing blood or turbid protein, or intrahepatic biloma. In case of a doubtful differentiation, doing further sonography will be helpful, or a 6-month follow up is recommended to observe internal content change.

Conclusion

A T2-FLAIR image on an MRI study is very useful to differentiate between hepatic cysts and hemangioma; the accuracy is 99.05%, instead of multiphase contrasted MRI study. It will save costs and total scan time of the study, it will avoid the risk of contrast allergy and risks to patients with renal function impairment.

References

1. Regev A, Reddy KR. Diagnosis and management of cystic lesions of the liver. (Accessed August 15, 2016, at <https://www.uptodate.com/contents/diagnosis-and-management-of-cystic-lesions-of-the-liver>).
2. Curry MP, Chopra S. Hepatic hemangioma. (Accessed August 15, 2016, at <https://www.uptodate.com/contents/hepatic-hemangioma#H1>).
3. Fowler KJ, Brown JJ, Narra VR. Magnetic resonance imaging of focal liver lesions: approach to imaging diagnosis. *Hepatology* 2011;54(6):2227-34.
4. The American College of Radiology. ACR practice parameter for the performance of magnetic resonance imaging (MRI) of the abdomen (excluding the liver), Revised 2015 (Resolution 2). (Accessed August 20, 2016 at https://www.acr.org/~/-/media/ACR/Documents/PAGS/guidelines/MRI_Abdomen.pdf).
5. Hajnal JV, De Coene B, Lewis PD, et al. High signal regions in normal white matter shown by heavily T2-weighted CSF nulled IR sequence. *J Comput Assist Tomogr* 1992;16:506-13.
6. Hajnal JV, Bryant DJ, Kasuboski L, et al. Use of fluid attenuated inversion recovery (FLAIR) pulse sequences in MRI of the brain. *J Comput Assist Tomogr* 1992;16:841-4.
7. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;33(1):159-74.
8. Motoomi OH, Tsutomu KA, Satoru NA, et al. Use of fluid-attenuated inversion recovery (FLAIR) pulse sequences for differential diagnosis of hepatic hemangiomas and hepatic cyst. *Acta Medica Okayama* 1997; 51: 275-8.
9. Sasaki K, Ito K, Koike S, et al. Differentiation between hepatic cyst and hemangioma: additive value of breath-hold, multisection fluid-attenuated inversion-recovery magnetic resonance imaging using half-fourier acquisition single-shot turbo-spin-echo sequence. *J Magn Reson Imaging* 2005;21(1):29-36.