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CASE STUDY

PSEUDOLESION (THAD) OF LIVER AND TARGET SIGN IN HEPATIC ABSCESS ON MDCT

Dr. Sanjay M. Khaladkar, *Dr. Vidhi Bakshi, Dr. Rajul Bhargava and Dr. V. M. Kulkarni

Dr D.Y Patil Medical College and Research Centre, Pimpri, Pune

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ABSTRACT

Pseudolesions (THAD) of the liver and target sign are seen in liver abscess on MDCT. These resemble primary liver cancer or metastasis. THAD is suggestive of underlying liver disorder. THADare areas of enhancement on hepatic arterial phase that are as a result of a localized variation of hepatic arterial and portal venous supply. Double target sign in hepatic abscess is observed during dynamic CECT of the liver. This sign consists of a hypodense central abscess cavity surrounded by an inner hyperdense rim (corresponds to capsule of abscess) and outer hypodense zone (due to edema of hepatic parenchyma surrounding abscess). We report a case of 60 year old male patient having liver abscess in right hepatic lobe with target sign and abscess in left hepatic lobe with THAD on triphasic liver study.

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INTRODUCTION

Pseudolesions (THAD) of the liver and target sign are seen in liver abscess on MDCT. These resemble primary liver cancer or metastasis. THAD is suggestive of underlying liver disorder. It is useful in detecting and characterizing underlying liver disease. THAD can be hyper or hypovascular (the latter being less common). Differentiation of tumorous and nontumorous THAD is done on porto-venous phase images. THAD is divided into four types according to morphology - lobar, multisegmental, polymorphous and diffuse. THAD are areas of enhancement on hepatic arterial phase that are as a result of a localized variation of hepatic arterial and portal venous supply. Segmental and subsegmental THADs on MDCT are caused by intrahepatic abnormalities such as segmental portal branch occlusion, arterio-portal shunting, tumors, biliary obstruction, and hepatic venous outflow obstructions. (Ravikumar *et al*., 2006) Double target sign in hepatic abscess is observed during dynamic CECT of the liver. This sign consists of a hypodense central abscess cavity surrounded by an inner hyperdense rim (corresponds to capsule of abscess) and outer hypodense zone (due to edema of hepatic parenchyma surrounding abscess).

Corresponding author: Dr. Vidhi Bakshi,
Dr D.Y Patil Medical College and Research Centre, Pimpri, Pune

Case report

A 60 year old male patient presented with pain in the upper abdomen with fever since one week.

USG Abdomen showed a well-defined multilocular hypoechoic lesion in the right hepatic lobe measuring 10.5(AP) x 9.5(T) x11(SI) cm in the right hepatic lobe. Another multilocular hypoechoic lesion 2(AP) x 2.2(T) x 2.5(SI) cm was noted in the medial segment of the left lobe, 1.5x0.8 cm noted inthe lateral segment of the left lobe. These lesions showed multiple fine internal echoes suggestive of liquefied abscess. Mild ascites was noted in the pelvis. Mild right basal pleural effusion was also noted. Triphasic liver study on MDCT showed hepatomegaly with a large well defined multilocular, hypodense lesion measuring approx. 10.6(AP) x 9.2(T) x11.1 (CC) cm in the right hepatic lobe (segment VII and VIII);multilocular lesion measuring approx. 2(AP) x 2.2(CC) x 2.8(T) cm in the medial segment of the left lobe (IV b), hypodense lesion measuring 1.3x0.8 cm in the lateral segment of the left lobe (II) (Figure.1). The inner contents showed a CT value of 15-20 HU suggestive of fluid nature. On contrast administration, these lesions showed peripheral rim enhancement (Figures 2, 3, 4) Imaging findings were suggestive of multiple abscesses with large multilocular abscess in right lobe. Large ill-defined perifocal hypodense area was noted in right lobe adjacent to abscess in arterial and porto-venous phases (Figures 2,3) which became isodense with

hepatic parenchyma in the delayed phase(Figure 4) suggestive of perifocal edema with resultant double target sign (inner hyperdense enhancing rim with peri focal hypodense outer rim).

The regional attenuation difference was noted in right lobe adjacent to right hepatic lobe abscess with a subtle increase in density in the arterial phase. Which became isodense in porto-venous. This represented THAD (Hypervascular, sectorial type).

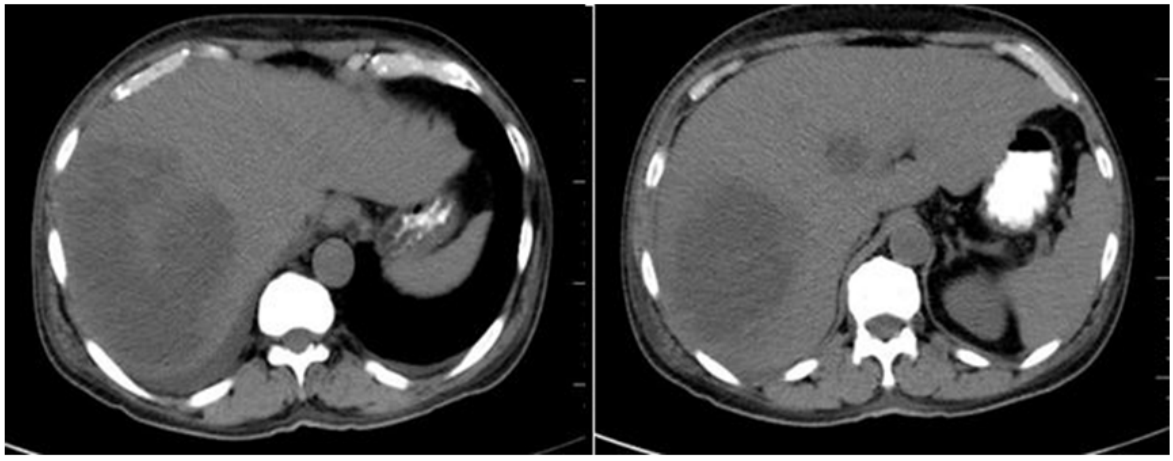

Figure 1. CT Abdomen (plain) axial shows evidenceof well-defined multilocular, hypodense abscess in the right hepatic lobe (segment VII and VIII) and in the medial segment of the left lobe (IV b)

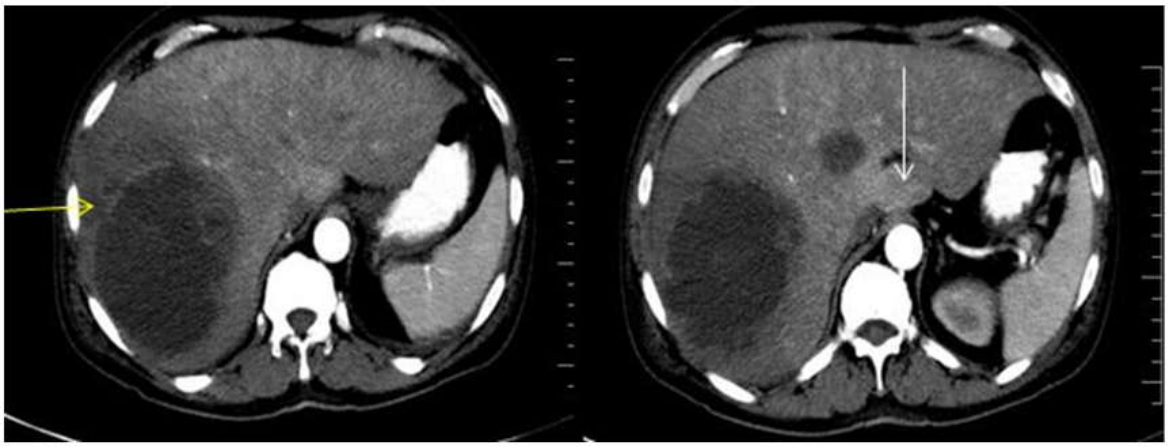

Figure 2. CT Abdomen (Arterial phase) Regional attenuation difference is noted in left lobe adjacent to left hepatic lobe abscess (white arrow) with a subtle increase in density (THAD). Large ill-defined perifocalhypodense area (yellow arrow) is noted adjacent to right hepatic lobe abscess (Target sign)

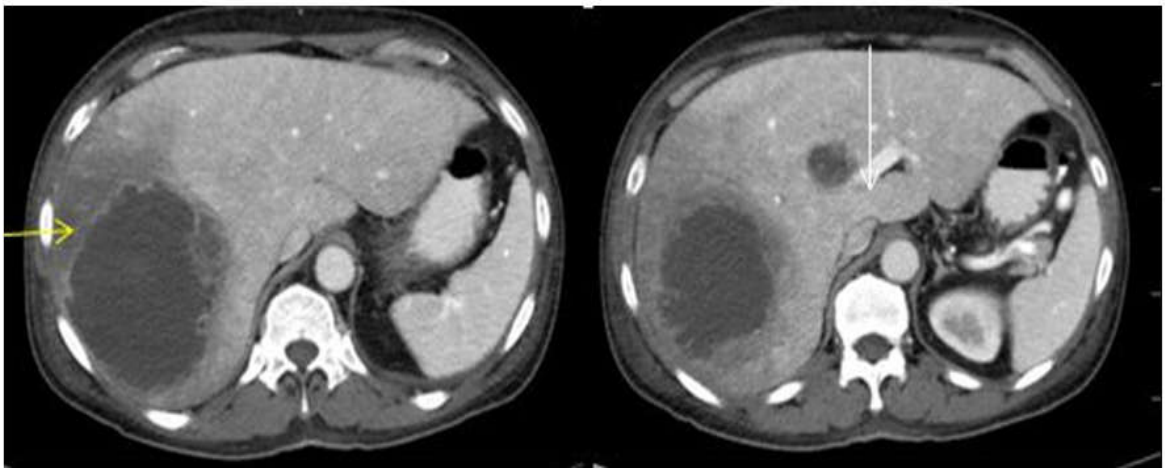

Figure 3. CT abdomen (Portal phase) Axial- show persistence of the perifocalhypodense area (yellow arrow) adjacent to abscess in the right lobe (Target sign), previously noted THAD in left lobe adjacent to abscess has become isodense with rest of the liver (white arrow)

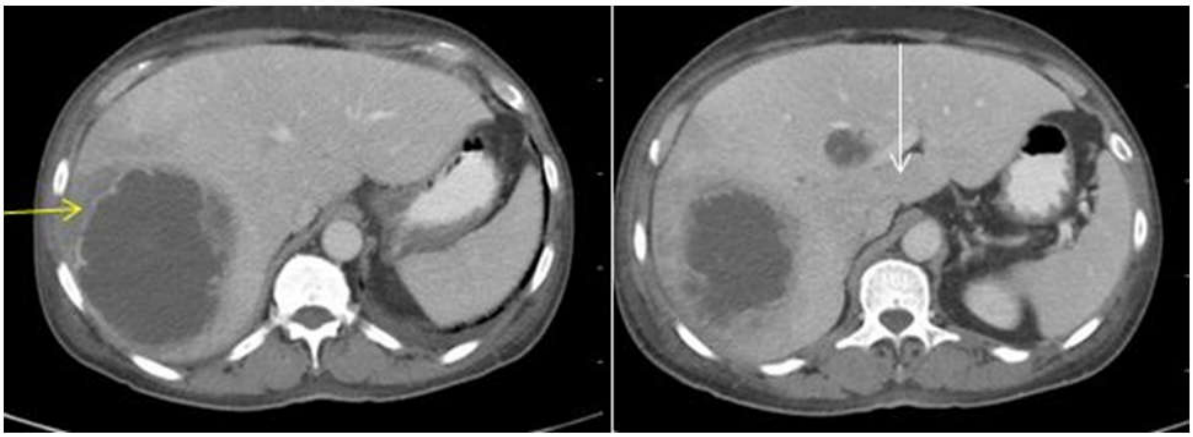

Figure 4. CTabdomen (venous phase) Axial- show persistence of the perifocalhypodensearea (yellow arrow) adjacent to abscess in right lobe (Target sign), previously noted THAD in left lobe adjacent to abscess has become isodense with rest of the liver (white arrow)

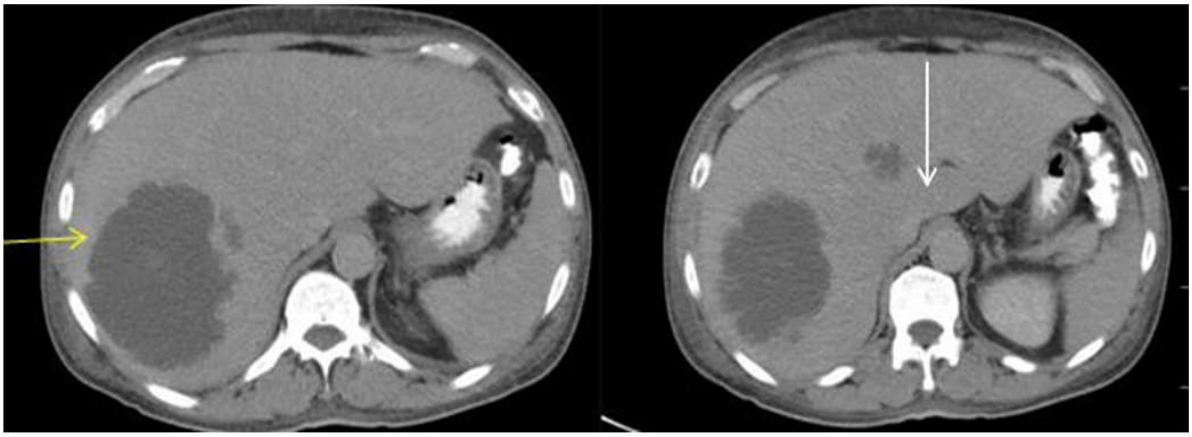

Figure 5. CT abdomen (Delayed phase) Axial- Previously mentioned perifocal hypodense area adjacent to abscess in right lobe has become isodense with rest of the liver (yellow arrow), previously noted THAD in left lobe adjacent to abscess has become isodense with rest of the liver (white arrow)

DISCUSSION

The liver has a dual blood supply with compensatory relationship. 70% of blood supply is from the portal vein, 30% is from the hepatic artery. Arterial flow increases when portal flow decreases. (Ravikumar *et al*., 2006) THAD is divided into four types according to morphology lobar, multisegmental (involve almost all segments of one hepatic lobe and caused by an increase in arterial inflow); sectorial (follow portal vein branches). It is of two types–wedge and fan shaped, commonly seen in liver abscess); polymorphous (do not follow portal vein branches and show various shapes and sizes without straight border sign) and diffuse (involves entire hepatic parenchyma, may assume patchy, central, peripheral or peribilliary pattern on the bases of location of portal blockage). (Ravikumar *et al*., 2006) Hypervascular THAD isseen as anarea of increased attenuation in hepatic arterial phase that reverts to normal on porto-venous phase. Hypervascular THAD shows straight border sign (seen as a well-defined margin representing a vascular territory) and vessel penetration sign (blood vessels transgressing the affected vascular territory indicating a mass effect. It is often wedged shaped to represent a vascular territory. Hypovascular THAD is due to non-portal blood supply (aberrant veins or third inflow) and hepatic venous outflow obstruction due to thrombosis or mass. (Ravikumar *et al*., 2006) The incidence of THAD in pyogenic abscess is 30-67 %. It is either due to portal vein thrombosis or stenosis due to peripheral inflammation or due to localized hepatic venous obstruction as a result of acute inflammation of hepatic parenchyma surrounding the abscess. (Kim *et al*., 2005) There is a regional diminution in portal blood flow due to venous thrombosis or elevated hepatic sinusoidal pressure, while hepatic arterial blood supplying that region will not be diluted by unopacified portal blood with a resultant focal area of increased attenuation during the arterial phase. (Tian and Zhang, 2006) Most THAD in pyogenic abscess decrease in size and finally disappear with antibiotic treatment along with reduction in size of pyogenic abscess due to a reduction in inflammation of portal tract in follow up dynamic CT performed 10-17days after initial CT. This is due to recovery of porto-venous flow and decrease in arterial flow. Mathieu *et al.* reported presence of transient segmental/ wedge shaped enhancement in the arterial phase of dynamic CT. (Mathieu *et al*., 1985) It is due to decrease in portal flow and compensatory increase of arterial flow. Pathologically, portal tracts of hepatic parenchyma surrounding a hepatic abscess

showed marked infiltration of inflammatory cells with stenosis of portal venules. This results in reduction of portal flow and compensatory increase in arterial flow. Various mechanisms of segmental hepatic enhancement include portal vein compression or thrombosis, local hyperaemic changes, arterio-portal shunt/steal effect and hepatic venous outflow obstruction/ thrombosis, aberrant blood supply and cholangitis. (Gabata *et al*., 2001) Hepatic abscess should be differentiated from tumor associated with segmental enhancement caused by portal or hepatic vein stenosis or occlusion and from tumorous or tumorous arterio-portal shunt. (Gabata *et al*., 2001) Plain and contrast enhanced dynamic CT are needed to differentiate these entities. Segmental enhancement associated with hepatic abscess is usually wedge shaped and its decrease in size on follow up dynamic CT study. Multiple hepatic abscesses with rim enhancement may simulate multiple necrotic hepatic metastases with peripheral rim enhancement. In these cases, segmental enhancement surrounding the abscess will be helpful in differentiating. Hepatic abscess on dynamic CT are seen are single or multilocularhypodense mass showing a peripheral rim or capsule which shows enhancement on CECT. (Kim*et al*., 2005) Mathieu *et al* reported a double target sign in hepatic abscess during dynamic study. (Gabata *et al*., 2001) This sign consists of a hypodense central abscess cavity surrounded by inner hyperdense rim and outer hypodense zone on dynamic CECT. It was found in 30% of cases by Mathieu *et al*. This target appearance (single or double) of rim sign is a characteristic sign of hepatic abscess on dynamic CT. The inner enhancing ring corresponds to capsule of abscess with the outer hypodense zone is due to edema of hepatic parenchyma surrounding abscess. (Gabata *et al*., 2001) Pseudolesions of the liver seen on CT resemble primary liver cancer or metastasis. They are caused by unusual hemodynamics or focal hemodynamics changes of the liver. THAD are seen during the dynamic liver study as attenuation difference of the liver that does not correspond to a mass. Non tumorous THAD appears as an area of high attenuation in arterial phase that returns to normal attenuation during porto-venous phase. A straight line margin, wedge shaped and presence of normal vessels coursing through lesion on arterial phase is diagnostic of THAD. Differentiation between tumorous and nontumorous THAD is essential and is done on porto-venous phase. THAD are seen as normal attenuation on porto-venous images while hypervascular tumors are seen as low attenuation. (Choi *et al*., 2002)

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Conclusion

Radiologists should be familiar with appearance of pseudolesions- THAD and target sign to avoid the false-positive diagnosis of hepatic tumors and to avoid overestimation of the extent of the disease.

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