Journal of Ecology of Health & Environment
An International Journal

http://dx.doi.org/10.18576/jehe/120102

Beaver Tail Liver, the Misleading Uncommon Radiological Sign: Case Study

Ahmad M. Abodahab[1,2,], Gamaleddin M. Saleh[2], Asmaa M. Hassan[3,4] and Wael M. Temraz[5].*

[1] Radiology Department, Faculty of Medicine, Sohag University, Sohag, Egypt.
[2] Radiology Department, Olaya Medical Center "OMC", Riyadh, KSA.
[3] Department of Tropical medicine & Gastroenterology, Faculty of Medicine, Assiut University, Assiut, Egypt.
[4] Internal Medicine and Hepatology Department, Olaya Medical Center "OMC", Riyadh, KSA.
[5] ER Department, Olaya Medical Center "OMC", Riyadh, KSA.

Received: 4 Mar. 2024, Revised: 20 Mar. 2024, Accepted: 24 Apr. 2024
Published online: 1 Nov. 2024

Abstract: This case study is explaining and discussing the sign of Beaver tail liver aiming to make it clear for every radiologist to avoid missing it. Abdominal pain is a common medical presentation. Abdominal ultrasound and/or CT are the first imaging modalities in such like cases. Beaver tail liver is a misleading anatomical finding that can be misinterpreted in imaging reports, especially abdominal ultrasound and can lead to unindicted surgical exploration of the case.

Keywords: Beaver tail liver, Liver left lobe, splenic hematoma, CT Abdomen.

1 Introduction

Abdominal pain is a very common presentation in all age groups. A major sector of it may be due to trauma due to many causes (Assault from others, falling from a height, motor car accident, sportive injuries …. etc) which are a common presentation to ER departments, other non-traumatic causes of abdominal pain are also a common presentation that needs to be investigated by imaging. Radiological examinations are the main investigations to assess these cases according to clinical findings. Abdominal ultrasound is the first and most commonly indicated imaging modality to assess cases of abdominal pain or trauma. The result of this scan with the clinical state of the case is the main guides to decide it either to conserve for just follow-up, doing another imaging modality as a CT abdomen, or exploring surgically when indicated. Beaver tail liver sign is an uncommon sign that is commonly mislead radiologists, especially in abdominal ultrasound (1,2,10). **Beaver** is a large type of rodents leaves in north America and has a special wide tail which using it in swimming (Fig 1).

Fig. 1: Beaver. Notice the wide tail helping it in swimming. https://en.wikipedia.org/wiki/Beaver#/media/File:Castor_canadensis1.jpg

2 Case Report:

14 years old female patient presented to the internal medicine clinic with epigastric pain, bloating, and distension of 3 months duration with a history of intermittent constipation of 1 year. The patient presented with an abdominal ultrasound scan report revealed that the patient has a large splenic subcapsular hematoma. No history of abdominal trauma. On clinical examination vital signs were stable, and the abdomen was lax with no localized or generalized tenderness. Lab investigations (complete blood count, bleeding time) were normal. The patient was referred to the radiology department for enhancing CT abdomen. CT abdomen was done by multislice CT machine "**Siemens – Somatom Emotion**" 16 slices. Pre- and post-contrast axial scan was done with intravenous contrast, reformatted sagittal and coronal scans was done. The pre-contract scan "axial and coronal reformate" are showing homogenous soft tissue density extension of hepatic left lobe extending to the left side above and anterior to the spleen (Fig 2). This part which (yellow arrow) is the extending part of the left lobe that gives the appearance of a beaver tail.

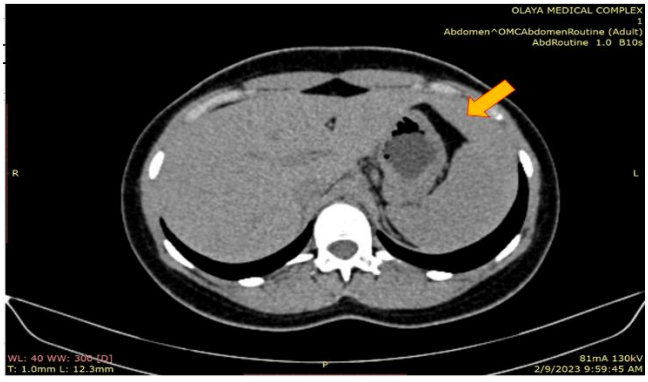

Fig. 2: 14 years old female - Axial non enhanced CT scan

*Corresponding author e-mail: dr.ahmadabodahab@gmail.com

of the abdomen, the cut section at the upper abdomen showing a homogenous soft tissue density structure related to the anterior and lateral aspect of the spleen (yellow Arrow) and continuous with the left lobe of the liver.

In axial and coronal post contrast scan, the extending part of the liver shows hepatic vasculature passing inside it which confirms with no doubt that this tissue is a part of hepatic tissue (Fig 3).

Fig. 3: -the same scan Coronal reformate non enhanced CT scan of the abdomen, notice the thin line of fat separating the extending part of left hepatic lobe

Both Axial and Coronal reformate images have good value in confirmation of diagnosis. The thin line of peritoneal fat that separates this part of the liver from the spleen (Fig 3). The arterial phase in post-contrast CT abdomen is the main phase that can explain the difference between the spleen and the extending hepatic tissue. The spleen usually shows mottled arterial enhancement (Fig 4& 5) that completely differentiates it from the "beaver tail" adjacent hepatic tissue in both axial and reformate coronal scans.

Fig. 4: 14 years old female - Axial enhanced CT scan of the abdomen (arterial phase), the spleen is showing a significant mottled early arterial enhancement that make it much more differentiated than the adjacent hepatic tissue.

Fig. 5: 14 years old female –Coronal reformatted enhanced CT scan of the abdomen (arterial phase), the spleen is showing a significant mottled early arterial enhancement that make it much more differentiated than the adjacent hepatic tissue.

3 Discussion:

The beaver tail sign of the liver is a relatively uncommon anatomical sign that can be misleading to radiologists, especially in abdominal ultrasound. The superimposing of this part of the liver over the spleen makes it confuse to be misinterpreted as a sub-capsular hematoma or a splenic mass (Fig 6). If this sign is associated with other signs related to abdominal trauma as collection, it may be diagnosed as grade II: III splenic injury that makes patient liable to surgical exploration with no real indication which will expose the patient to the associated complications with no value(3,4,11).

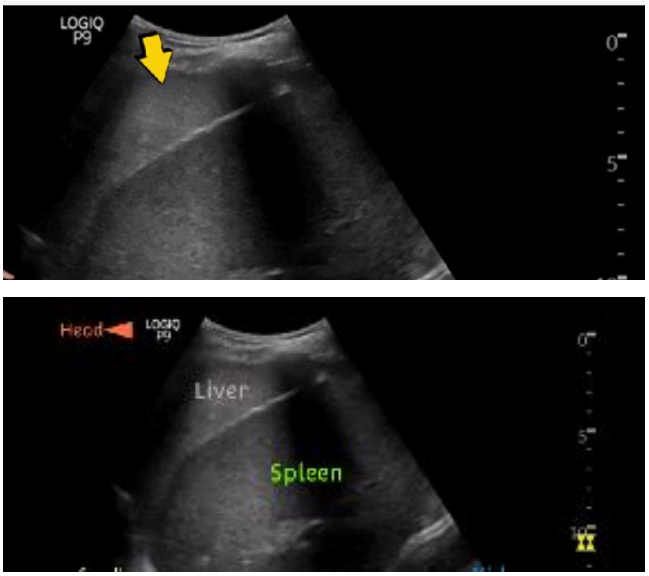

Fig. 6: A & B - Beaver tail sign in abdominal ultrasound, the extending part of the liver (yellow arrow) can be misleading to radiologists. https://nephropocus.com/

The beaver tail sign of the liver has this name because of the general outline and curvature of the liver and the extension of the left lobe to the left side above the spleen is similar to the shape of a beaver and its wide tail (Fig 7 A&B). Axial & coronal reformate scans have the main value in diagnosis, especially I.V. post-contrast "enhanced" scans. Sagittal scans have the least value in diagnosis as it cannot explain the direct connection between liver tissue and the extending part related to the spleen (5,6,7). Chest X ray has no definite role in diagnosis even with the Presence of continuity between liver shadow beyond Medline to the left side as this nonspecific finding (Fig 8) and can be seen in another case hasn't beaver tail sign(8,9).

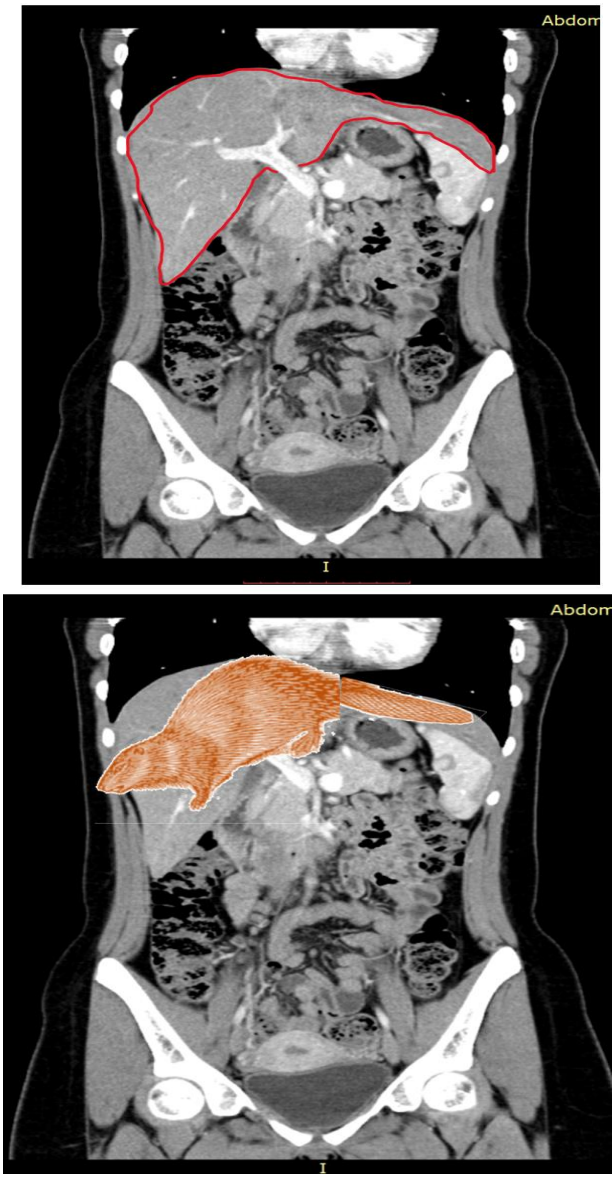

Fig. 7: A&B - Female patient 14 y, Coronal reformate enhanced CT scan of the abdomen, the liver is outlined with red line in Fig A. In Fig B an image of beaver is added above liver to explain the appearance of beaver tail sign in comparison to the animal itself.

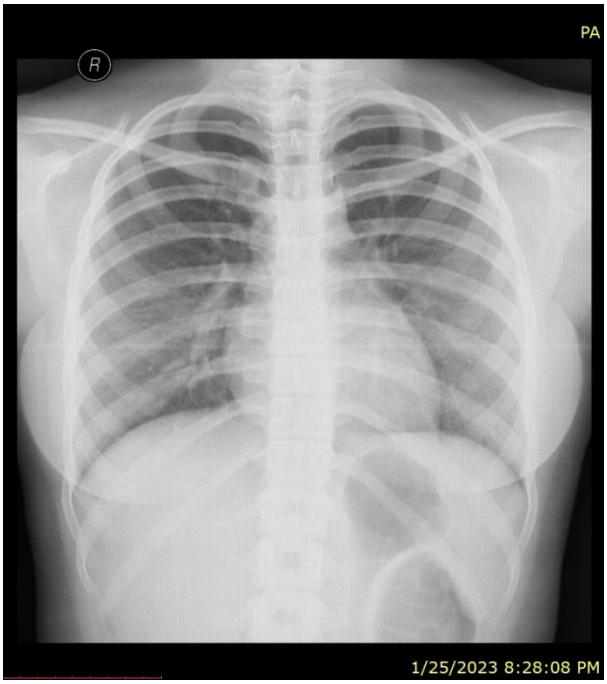

Fig. 8: Chest X ray of the same case was done in previous time due to mild chest infection, which cannot be suggesting of beaver tail sign diagnosis.

4 Conclusion:

Beaver tail liver is a not common anatomical sign of the liver due to the extension of most medial parts of the left hepatic lobe to the left side above and anterior to the spleen. It can be a misleading sign diagnosed as sub-capsular splenic hematoma which can liable the patient to unindicted abdominal surgery especially if other associated clinical data is suggestive. It can be diagnosed by ultrasound but CT abdomen is the modality of choice for diagnosis. Every radiologist needs to know this sign for proper diagnosis and avoid its misleading interpretation.

References:

[1] Khanduri S, Malik S, Khan N, et al. (July 12, 2021) Beaver Tail Liver: A Hepatic Morphology Variant. Cureus 13(7): e16327. DOI 10.7759/cureus.16327

[2] Narra R, Kamaraju SK. Beaver tail liver: A rare anatomical variant. Indian J Case Reports. 2020; 6(10):604.

[3] Covantsev S, Lebedinsky I, Slepukhova D, Kovaleva M, Mulaeva K. Beaver tail liver: an incidental but crucial anatomical variation in case of acute abdomen. Iberoam J Med. 2023. doi: 10.53986/ibjm.2023.0008.

[4] Marijana Rogulj, MDa,1,∗, Katarina Brzica, MDa,1, Matea Ivancic, MDb, Angela Renic, MD Beaver tail liver on pediatric chest X-ray R a d i o l o g y C a s e R e p o r t s 1 7 (2 0 2 2) 4 7 8 0 – 4 7 8 3

[5] Atalar MH, Karakus K: Beaver tail liver. Abdom Radiol (NY). 2018, 43:1851-1852. 10.1007/s00261-

017-1395-x

[6] Arkoudis et al. Egypt J Radiol Nucl Med (2022) 53:148 https://doi.org/10.1186/s43055-022-00824-x

[7] Cholankeril JV, Zamora BO, Ketyer S: Left lobe of the liver draping around the spleen: a pitfall in computed tomography diagnosis of perisplenic hematoma. J Comput Tomogr. 1984, 8:261-267. 10.1016/0149-

[8] Xiang H, Han J, Ridley WE, Ridley LJ. Beaver tail liver: Anatomic variant. J Med Imaging Radiat Oncol 2018;62 Suppl 1:57.

[9] Glenisson M, Salloum C, Lim C, Lacaze L, Malek A, Enriquez A, et al. Accessory liver lobes: anatomical description and clinical implications. J Visc Surg. 2014;151(6):451-5. doi: 10.1016/j.jviscsurg.2014.09.013.

[10] Yilmaz Cankaya B. Can beaver tail liver be the cause of preference in living liver transplantation donors? Eurasian J Med 2021;53(1):53–6.

[11] Crivello MS, Peterson IM, Austin RM (1986) Left lobe of the liver mimicking perisplenic collections. J Clin Ultrasound 14:697–701