

CASE REPORT

Open Access



“Hiding beaver tail liver”: a rare case report of a beaver tail liver lookalike variant located medially to the spleen, mimicking a perisplenic hematoma

Nikolaos-Achilleas Arkoudis^{1*} , Konstantinos Stamelos², Athanasios Tsochatzis¹ ,
Ornella Moschovaki-Zeiger¹ and Stavros Spiliopoulos¹

Abstract

Background: Liver lobe anatomic variations are uncommon and may often cause clinical difficulties. We present a trauma patient with a previously unreported (to our knowledge) hepatic morphology, which was initially misdiagnosed as a possible perisplenic hematoma, leading to unnecessary further investigations.

Case presentation: A 32-year-old male patient was brought to our hospital's emergency department following a low-energy motor vehicle accident. The patient was ambulatory, had a GCS of 15/15, and appeared hemodynamically stable with normal hematocrit (Hct)/hemoglobin (Hb) blood counts. No clinical signs/symptoms of bleeding were noted, and no significant complaints were documented, besides minor left flank tenderness with overlying abrasions. The patient's past medical history was insignificant. FAST (Focused Assessment with Sonography for Trauma) scan performed gave the impression of a crescent-shaped hypoechoic lesion/collection medially to the spleen, raising suspicion of a perisplenic hematoma. Subsequent computed tomography (CT) scan displayed no trauma-related findings, while the suspected hematoma was seen to correspond to variant left hepatic lobe morphology.

Conclusion: The “hiding beaver tail liver” (HBTL) is a hepatic morphology variant encountered when the lateral part of the left liver lobe (beaver's tail) extends across the midline and lies medially to the visceral surface of the spleen, following an acute angulation (in hiding). As it can mimic true pathology, familiarity with this morphology is crucial to avoid false diagnosis and unnecessary investigations.

Keywords: Anatomic variant, Emergency, Radiology, Case report, Case, Liver, Anatomy, Hematoma, Ultrasound, Computed tomography

Background

Liver lobe anatomic variations are uncommon and may often be the source of clinical difficulties [1]. There may be ectopic liver lobes which are completely independent,

sharing no anatomical continuation with the main organ, and there may also be supernumerary liver lobes which are in fixed or pedunculated anatomical continuation with the main organ, displaying normal parenchymal structures (i.e., vessels, biliary ducts) [2]. We present a trauma patient with an anatomic variation of the left liver lobe, which was initially misinterpreted as a possible perisplenic hematoma, leading to unnecessary further investigations. To our knowledge, the anatomic variation we encountered in the present case has not been previously

*Correspondence: nick.arkoudis@gmail.com

¹ 2nd Department of Radiology, General University Hospital “Attikon”, Medical School, National and Kapodistrian University of Athens, Rimini 1 Str., Chaidari, 12462 Athens, Greece

Full list of author information is available at the end of the article

reported. Additionally, its ability to represent a diagnostic pitfall further enhances its educational value. As a result, we propose a specific name for its characterization that is inspired by existing literature.

Case presentation

A 32-year-old male patient was brought to our hospital's emergency department following a low-energy motor vehicle accident. At the time of presentation, the patient was ambulatory, had a GCS of 15/15, and appeared hemodynamically stable with normal Hct/Hb blood counts. No clinical signs or symptoms of bleeding were noted, and no significant complaints were documented, besides minor tenderness over the left flank and overlying abrasions detected on physical examination. The patient's past medical history was insignificant. As per protocol, a FAST (Focused Assessment with Sonography for Trauma) scan was ordered. At the time of examination

of the left upper quadrant, a crescent-shaped hypoechoic lesion/collection was documented medially to the spleen, raising suspicion of a perisplenic hematoma (Fig. 1). No other significant findings were noted in the remaining regions being scanned. The positive FAST scan mandated further investigation and, since the patient remained stable, he was immediately transferred to the CT room. A contrast-enhanced abdominopelvic CT scan was performed, which did not identify the presence of intraperitoneal free fluid, solid organ injury, or any other significant or trauma-related findings. However, variant left hepatic lobe morphology was demonstrated, as shown and described in Fig. 2. This modified appearance was recognized to correspond to the erroneously suspected perisplenic hematoma depicted in the initially performed false-positive FAST scan. Given the absence of any significant clinical, laboratory, or trauma-related imaging findings, the minor left flank tenderness was attributed to the overlying skin abrasions, and the patient was finally discharged the next day, following an uneventful observation.



Fig. 1 Left upper quadrant view during a FAST (Focused Assessment with Sonography for Trauma) examination. A mildly hypoechoic crescent-shaped region is showcased (indicated by the outlined dashed oval area) medially to the upper half of the spleen (S), raising suspicion of a possible perisplenic hematoma

Discussion

Although anatomic variations of the liver lobes are uncommon, their incidence may often present clinical difficulties [1]. As previously mentioned, there may be ectopic and accessory liver lobes. The most usually encountered accessory lobe is the Riedel's lobe, which resembles a segmental hypertrophy of the right liver lobe [2]. Additionally, the size of the left hepatic lobe, as well as its shape, may also demonstrate variations. A well-known variation of hepatic morphology is demonstrated when part of the left liver lobe extends through the midline into the left upper quadrant, partly encasing

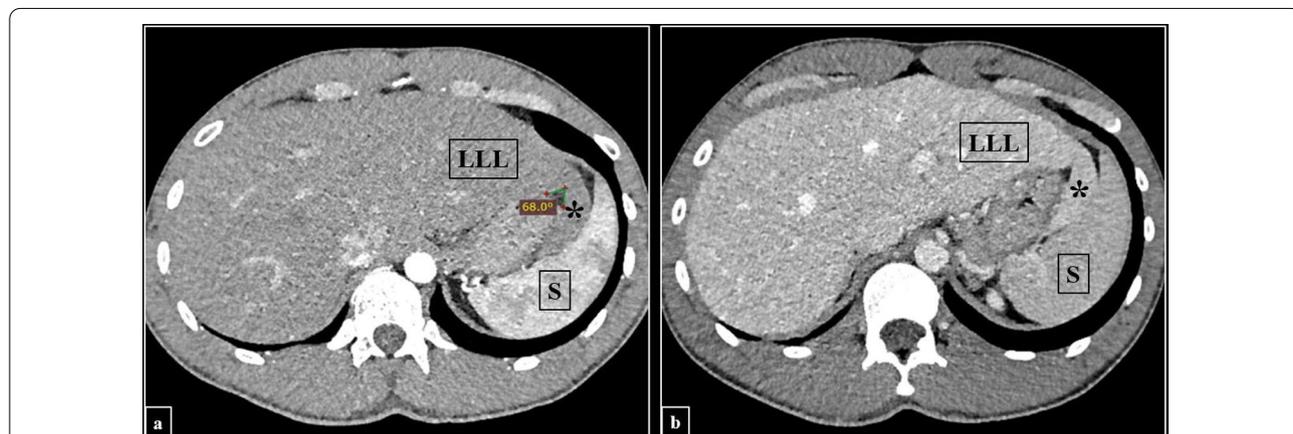


Fig. 2 CT scan of the abdomen and pelvis. Axial CT image in the arterial (a) and portal (b) scanning phase demonstrate extension of the lateral part of the left liver lobe (LLL) across the midline. Following an acute angulation (a), the left liver lobe parenchyma is seen to assume a crescent shape (asterisk), lying juxtaposed to the spleen (S) medially to its visceral surface

the spleen from its anterior aspect [3]. Due to its resemblance to a beaver's tail, this appearance has been documented in the literature as the "beaver tail liver" [1, 4, 5]. Liver parenchyma in this variation is composed of normal tissue [1], and hence, it does not present an added risk of developing intrinsic pathology [6]. However, although this has not been specifically proven, the "beaver tail liver" has been considered as more susceptible to injury in the setting of upper abdominal or lower chest trauma [4, 6, 7], probably due to its superficial location with respect to the spleen. Familiarity with this variant is of utmost importance in the context of abdominal trauma since the unexpected proximity of the liver and spleen can be misconstrued as a perisplenic or splenic subcapsular hematoma on imaging examinations [1, 8–11], leading to diagnostic pitfalls.

In the present case, we describe a trauma patient with an analogous pitfall owing to a previously unreported left liver lobe morphology that was initially misdiagnosed as a perisplenic hematoma on the FAST (Focused Assessment with Sonography for Trauma) scan. In our patient, the lateral part of the left liver lobe was found lying in juxtaposition to the spleen, medially to its visceral surface, after extending across the midline, angulating acutely, and assuming a crescent-shaped configuration. Inspired by the aforementioned well-known "beaver tail liver" variant, we perceived that in our case, the crescent-shaped liver parenchyma also resembled a beaver's tail, which, however, due to the acute angulation and its medial juxtaposition to the spleen's visceral surface, appeared to be "in hiding" (Fig. 3). Hence, we propose the use of the term "hiding beaver tail liver" (HBTL) for the description of this unique appearance. It should be emphasized that the HBTL morphology should not be confused with findings such as the "kissing sign" of liver and spleen, encountered on imaging when the aforementioned organs contact each other in patients with hepatomegaly and/or splenomegaly [12], nor with the above-mentioned "beaver tail liver" variant where the lateral part of the left liver lobe extends and surrounds the anterior and lateral aspect of the spleen [1]. Discriminating features of the HBTL morphology when compared to these appearances are the medial juxtaposition of the lateral part of the left liver lobe to the visceral surface of the spleen as well as the acute angulation between the lateral part of the left liver lobe and the remainder of the liver.

Similar to the "beaver tail liver," and as demonstrated by this case, the HBTL also poses the risk of being misinterpreted on imaging examinations as perisplenic or splenic subcapsular fluid/hemorrhage. This further highlights the educational value of this unique case and the need to familiarize radiologists and ultrasound-performing clinicians with this possible pitfall that may lead to redundant



Fig. 3 "Hiding beaver tail liver" illustration. The crescent-shaped lateral part of the left liver lobe parenchyma resembles a beaver's tail, which, due to the acute angulation and its medial juxtaposition to the visceral surface of the spleen, appears to be "in hiding." The remainder of the liver represents the beaver's body, from which the tail arises (illustration inspired by [5])

investigations. Whenever such a perisplenic/splenic "lesion" is suspected, the authors suggest the use of the same techniques that are suggested for the differentiation of true pathology from the "beaver tail liver" variant; those being angulations of the ultrasound transducer in an attempt to exclude or verify its continuity with the remainder of the liver [7], and the use of Color Doppler imaging in order to exclude or verify the presence of portal veins and/or hepatic vessels [1, 6, 8]. The authors speculate that contrast-enhanced ultrasound could also prove helpful in such a differential diagnosis conundrum by displaying contrast-enhancement of the liver parenchyma or absence of contrast-enhancement in the case of a hematoma. If, however, the ultrasound findings remain unclear, then further examinations such as CT should be obtained. In our case, the patient's left flank tenderness upon presentation further guided interpretation toward an initial false-positive diagnosis on FAST examination. However, the findings were eventually vindicated by the subsequent CT examination, and the patient's symptoms were attributed to the overlying abrasions.

Conclusions

The "hiding beaver tail liver" (HBTL) is a hepatic morphology variant encountered when the lateral part of the left liver lobe (beaver's tail) extends across the midline and lies medially to the visceral surface of the spleen, following an acute angulation (in hiding). This characteristic morphology distinguishes it from other similar appearances such as the well-known "beaver tail liver" variant and the "kissing sign" of liver and spleen. Radiologists

and ultrasound-performing clinicians must be aware of this variant morphology and the techniques with which it can be differentiated from true pathology, as it can mimic a perisplenic hematoma, leading to false diagnosis and unnecessary further investigations.

Abbreviations

GCS: Glasgow Coma Scale; Hct: Hematocrit; Hb: Hemoglobin; FAST: Focused Assessment with Sonography for Trauma; CT: Computed tomography; HBTL: Hiding beaver tail liver.

Acknowledgements

We would like to thank Enrico Moschovakis-Zeiger for performing the artwork in Fig. 3.

Author contributions

NAA substantially contributed to the conception, design, manuscript drafting and preparation, and revising of the work. KS, AT, and OMZ substantially contributed to drafting of the work. SS substantially contributed to the conception and design of the work. All authors read and approved the final manuscript.

Funding

The authors have no relevant financial or non-financial interests to disclose. No financial support was received for the preparation of this manuscript.

Availability of data and materials

Not applicable.

Declarations

Ethics approval and consent to participate

Institutional review board approval was waived for this report.

Consent for publication

The participant has consented to the submission of the case report to the journal.

Competing interests

The authors declare that they have no competing interests.

Author details

¹2nd Department of Radiology, General University Hospital "Attikon", Medical School, National and Kapodistrian University of Athens, Rimini 1 Str., Chaidari, 12462 Athens, Greece. ²Department of Radiology, Naxos General Hospital, Naxos, Greece.

Received: 30 March 2022 Accepted: 4 July 2022

Published online: 11 July 2022

References

- Atalar MH, Karakus K (2018) Beaver tail liver. *Abdom Radiol (N Y)* 43(7):1851–1852. <https://doi.org/10.1007/s00261-017-1395-x>
- Glenisson M, Salloum C, Lim C et al (2014) Accessory liver lobes: anatomical description and clinical implications. *J Visc Surg* 151(6):451–455. <https://doi.org/10.1016/j.jvisurg.2014.09.013>
- Caseiro-Alves F, Seco M, Bernardes A (2013) Liver anatomy, congenital anomalies, and normal variants. In: Hamm B, Ros PR (eds) *Abdominal imaging*. Springer, Berlin, pp 983–1000. https://doi.org/10.1007/978-3-642-13327-5_76
- Khanduri S, Malik S, Khan N, Singh H, Rehman M (2021) Beaver tail liver: a hepatic morphology variant. *Cureus* 13(7):e16327. <https://doi.org/10.7759/cureus.16327>
- Xiang H, Han J, Ridley WE, Ridley LJ (2018) Beaver tail liver: anatomic variant. *J Med Imaging Radiat Oncol* 62(Suppl 1):57. https://doi.org/10.1111/1754-9485.05_12784
- Narra R, Kamaraju SK (2020) Beaver tail liver: a rare anatomical variant. *Indian J Case Rep* 6(10):604–604. <https://doi.org/10.32677/IJCR.2020.v06.i10.019>
- Faez MS, Siti Sharifah Muhammad SJ (2017) Beaver in the liver. *Pan Afr Med J* 27:138. <https://doi.org/10.11604/pamj.2017.27.138.12227>
- Jones R, Tabbut M, Gramer D (2014) Elongated left lobe of the liver mimicking a subcapsular hematoma of the spleen on the focused assessment with sonography for trauma exam. *Am J Emerg Med* 32(7):814.e3–4. <https://doi.org/10.1016/j.ajem.2013.12.050>
- Crivello MS, Peterson IM, Austin RM (1986) Left lobe of the liver mimicking perisplenic collections. *J Clin Ultrasound* 14(9):697–701. <https://doi.org/10.1002/jcu.1870140906>
- Li DK, Cooperberg PL, Graham MF, Callen P (1986) Pseudo perisplenic "fluid collections": a clue to normal liver and spleen echogenic texture. *J Ultrasound Med* 5(7):397–400. <https://doi.org/10.7863/jum.1986.5.7.397>
- Cholankeril JV, Zamora BO, Ketyer S (1984) Left lobe of the liver draping around the spleen: a pitfall in computed tomography diagnosis of perisplenic hematoma. *J Comput Tomogr* 8(3):261–267. [https://doi.org/10.1016/0149-936x\(84\)90074-2](https://doi.org/10.1016/0149-936x(84)90074-2)
- Giambelluca D, Di Martino E, Salvaggio G (2019) The "kissing sign" of liver and spleen. *Abdom Radiol* 44:2323–2324. <https://doi.org/10.1007/s00261-019-01937-0>

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a SpringerOpen® journal and benefit from:

- Convenient online submission
- Rigorous peer review
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

Submit your next manuscript at ► [springeropen.com](https://www.springeropen.com)