

Research Article: Human Anatomy Case Report

Hepatic flexure in right sub diaphragmatic space and its embryological basis and clinical importance

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Abstract

The knowledge of variations in the large intestine and liver is of clinical importance from the anatomical and embryological points of view. Different positions of the hepatic flexure of large intestine, although generally asymptomatic, may have different impact on manifestations of disease. During routine cadaveric study of the abdominal region we observed a case where the hepatic flexure was interposed between the right dome of the diaphragm and the anterior surface of the liver. The liver appeared bilobulated and on the anterior surface the right and left hepatic lobes were separated by a deep furrow. The left wall of the furrow was attached to the falciform ligament. We have tried to explain such high position of hepatic flexure from an embryological point of view and to evaluate its possible clinical relevance. This abnormal site of hepatic flexure could cause chronic respiratory infections, twisting of the gut, volvulus and intestinal obstruction. Moreover it may alter the normal liver dullness on percussion. So clinicians and surgeons should be aware of this variant position of the hepatic flexure.

Key words

Chilaidity sign, mal rotation of gut, variant large intestine, volvulus.

Introduction

The liver is the largest abdominal organ, occupying the right hypochondrium, epigastrium and left hypochondrium. It performs a wide range of metabolic activities for the maintenance of homeostasis, nutritional status and immunological defence and the removal of toxic substances from the body. Hepatomegaly, shrinkage of liver or any anatomical variations can interfere with various metabolic processes. Clinically enlarged or atrophic liver can be identified by palpation and percussion. Normally the liver is dull on percussion of the right hypochondrial and epigastric regions. Alteration of normal liver dullness is of clinical importance. The sub-diaphragmatic interposition of the hepatic flexure and/or transverse colon is known as Chilaiditi's sign. Usually it is asymptomatic. When Chilaiditi's sign is associated with complications one speaks of Chilaiditi's syndrome. There are literature reports showing association of Chilaiditi's syndrome with multiple gut anomalies. There is no reference suggesting Chilaiditi's sign/syndrome association with liver gross anatomical variations. Probably first, our case reports the coexistence of an interpositioned hepatic

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flexure in the right hepato-diaphragmatic space and a bilobulated liver. We have tried to explain the embryological basis of such high position of the hepatic flexure and have commented on its clinical importance for medicine and surgery.

Case report

During routine cadaveric dissection of abdomen performed with first year under graduate Bachelor of medicine and bachelor of surgery students we observed the presence of the hepatic flexure of large intestine under the surface of the right dome of diaphragm and a bilobed liver in a 65 years old male. After reflecting the anterior abdominal wall we observed the interposition of the large intestine between liver and diaphragm (Fig. 1). Following the intestine it was observed that the right hepatic flexure was hosted in the right sub diaphragmatic space and was sandwiched between the diaphragm and anterior surface of the liver (Fig. 2). When we reflected downwards the hepatic flexure and large intestine we came across a clear view of bilobed liver. A wide depression, or furrow, on the anterior surface of the liver is shown in Fig. 3. The two lobes of the liver were widely separated from each other. The dis-

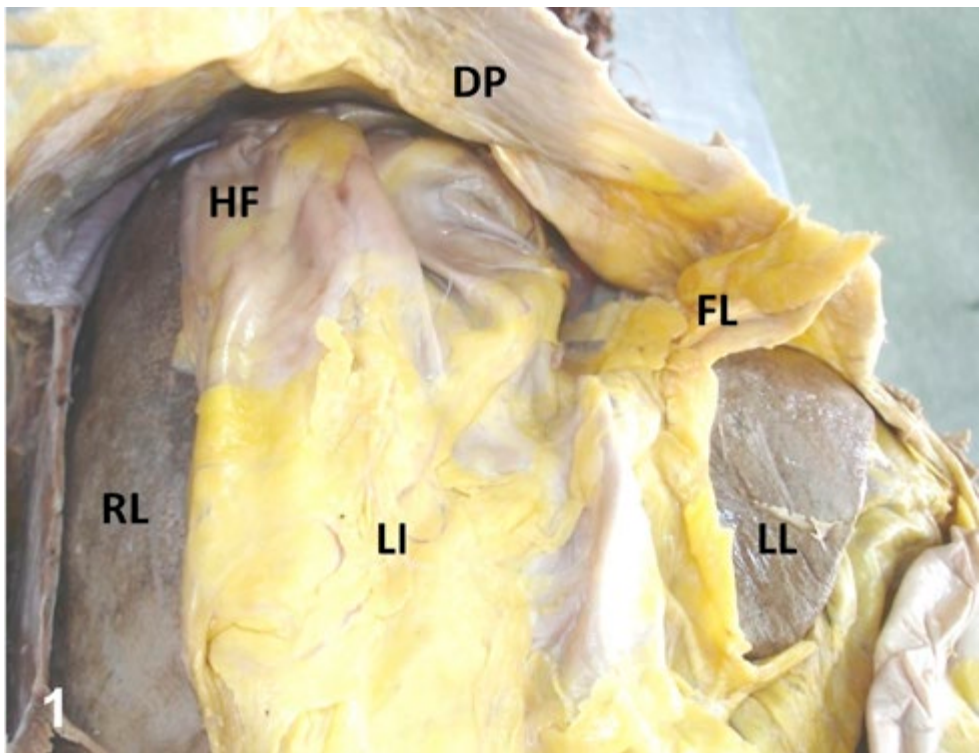


Figure 1 – Hepatic flexure situated under the diaphragm. DP: diaphragm; HF: hepatic flexure; FL: falciform ligament; RL: right liver lobe ; LL: left liver lobe; LI: large intestine.

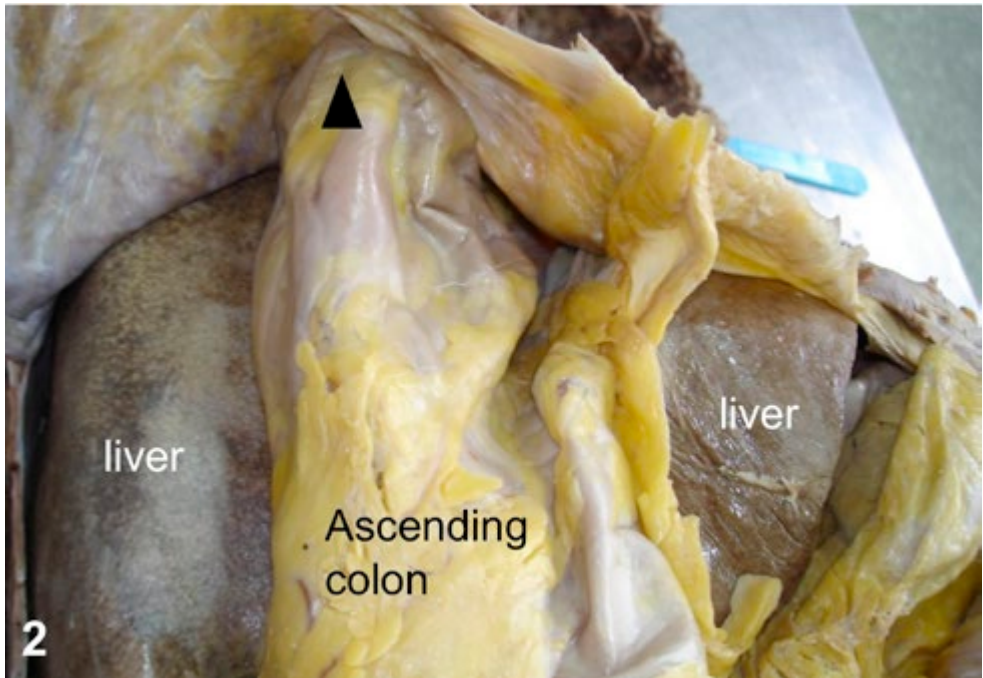


Figure 2 – The hepatic flexure is marked with a black arrowhead.

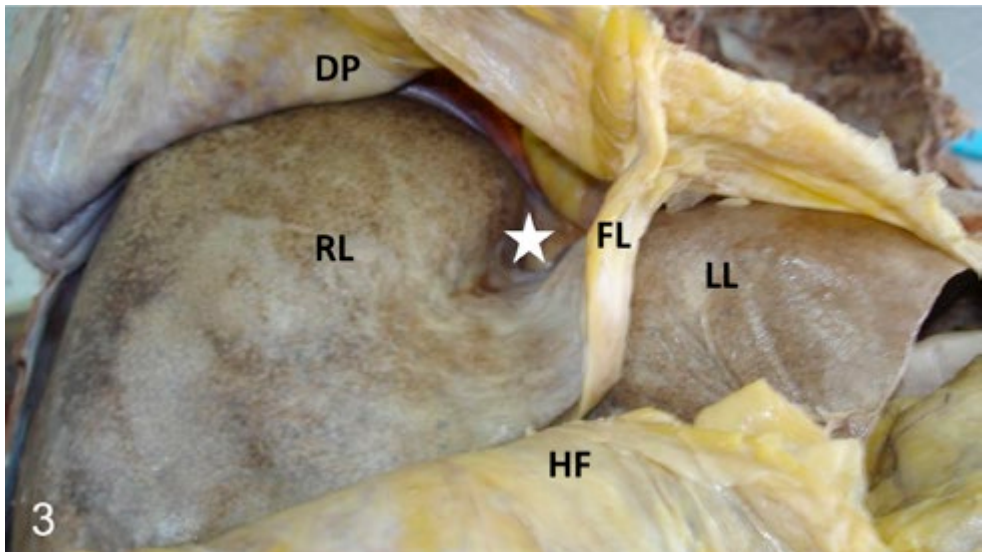


Figure 3 – Bi-lobed appearance of liver with attachment of the falciform ligament. The star indicates the furrow on the anterior surface of the liver. DP: diaphragm; HF: hepatic flexure; FL: falciform ligament; RL: right liver lobe; LL: left liver lobe; LI: large intestine.



Figure 4 – Caecum in the right iliac fossa. The arrow indicates the end point of caecum. HF: hepatic flexure; C: caecum.

tance between the two lobes was approximately 3-5 cm. The falciform ligament was attached along the left wall of the furrow and the right and left liver lobes were demarcated by that attachment. When we followed the two sides of the hepatic flexure we observed proximally a normally positioned terminal part of the ileum, caecum and appendix in the right iliac fossa (Fig. 4), and distally the splenic flexure at the anterior pole of spleen. The splenic flexure was normally placed and suspended from the lower surface of the diaphragm by a phrenicocolic ligament. The ascending colon was anterior to the right kidney and to the anterior surface of the right lobe of liver. The diameter was the same throughout the entire course of the ascending colon. The length of ascending colon appeared increased, being extended from the right iliac fossa to the right sub diaphragmatic space (Fig. 4). There was no fibrous connective tissue adhesion between the hepatic flexure and the anterior surface of the liver, which appeared smooth and covered with visceral peritoneum.

Discussion

The hepatic flexure, the junction between the ascending and transverse colon, is variable in position (Standring, 2008). The normal relations of the hepatic flexure are: anterior surface of the lower pole of the right kidney posteriorly, the right lobe of the liver superiorly and anterolaterally, the descending (2nd) part of the duodenum medially and the fundus of the gallbladder anteromedially. In the present case the right dome of diaphragm was placed superiorly and the anterior surface of the liver postero-inferiorly to the hepatic flexure. We tried to find out possible reason for the high position of hepatic flexure. The liver develops from the hepatic plate on the ventral side of the duodenum, which proliferates and forms the hepatic diverticulum and invades the mesenchyme of the septum transversum and ramifies into hepatic cords (Larson, 2009). The gross anatomical appearance of liver consists of a superior surface, an anterior surface and a right lateral surface. They are continuous with each other and there is no demarcation line between them. In the present case the gross anatomical appearance of the liver was characterized by separation of the right from the left lobe, on their superior and anterior surfaces, by a deep furrow, along the left wall of which the falciform ligament was attached. A major cause of the positioning of the transverse colon and right flexure between liver and diaphragm is most probably an exaggerated motility of those segments of the colon because of incomplete attachment of part of the mesocolon of ascending colon to the posterior abdominal wall. The upward growth of the caecal bud is arrested by the inferior surface of liver, and it grows towards the right iliac fossa. In this case, due to absence of an arresting factor, the caudal limb of the primary intestinal loop (Sadler, 2010), which was going to give rise to the ascending colon, hepatic flexure and transverse colon, migrated towards the diaphragm through the furrow in the anterior surface of the liver.

Congenital abnormalities of the intestine are common. Most of them are anomalies of gut rotation, non-rotation or malrotation that result from incomplete rotation and/or fixation of the intestines (Moore, 2008). In the present case the sub-diaphragmatic position of the hepatic flexure could be due to abnormal rotation of primary mid-intestinal loop and defect in the process of zygosis.

Though we don't know the exact cause of death of the subject as it was an unclaimed body, the present large gut variations may have had various clinical implications like recurrent volvulus and intestinal obstruction as reported by (Matthews et al., 2001). This condition may be rarely associated with volvulus of the transverse colon and splenic flexure. Recurrent respiratory distress has also been reported especially in paediatric cases. All together these alterations are called Chilaiditi's syndrome (Havenstrite et al., 1996; Barroso Jornet et al., 2003; Keles et al., 2006).

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