ACCESSORY LIVER FISSURES AND THEIR CLINICAL SIGNIFICANCE

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Summary

Congenital liver abnormalities are considered to be rare. But their presence can complicate different medical procedures. The knowledge of possible liver anatomy variations can be useful for hepatobiliary surgeons and radiologists. They are especially important for medical personal who work in the field of emergency medicine. Often such variations can have a clinical presentation or indicate an underlying pathological condition. We present a case report of multiple liver variations in a single organ complex with a review of the previous literature.

Rezumat

Fisuri hepatice accesorii şi semnificaţia lor clinică

Anomaliile hepatice congenitale se întâlnesc rar. Dar prezenţa lor poate complica diferite proceduri medicale. Cunoştinţa variaţiilor anatomice ale ficatului pot fi utile pentru chirurgi hepato-biliare si radiologi. Acestea sunt deosebit de importante pentru personalul medical care lucrează în domeniul de medicina de urgenta. Deseori, aceste variaţii pot avea o prezentă clinică sau indica o stare patologică care stă la baza. Noi prezentăm un caz de variaţii hepatice multiple într-un complex de organi unic cu analiza literaturii precedente.

Introduction

Congenital abnormalities of liver development are rare. But their clinical significance is large. Liver anatomical variations and anomalies should always be considered during surgery and diagnostic procedures such as computer tomography (CT). Current literature describes different liver abnormalities due to defective development. Generally they can be summarized into two categories: anomalies due to defective development and due to excessive development [14].

The information described in this article can be useful for hepatobiliary surgeons, radiologists and other specialists.

Greater knowledge about liver vascular and parenchymal anatomy has made liver surgery safer and more efficient [15].

The possible presence of abnormal liver has to be kept in mind during its evaluation. It is also import due to its diagnostical possibilities and the fact that they do not always remain clinicaly latent [11,13].

J. E. Skandalakis et al., 2004 have indicated that grooves can be confusing due to their multiple names.

M. P. Сапин, 1993 describes three fissures on the surface of the liver. The left fissure has two parts, separated by the transverse fissure. The anterior part is formed by the ligamentum teres. The posterior part is formed by the ligamentum venosum. The right fissure consists of gallbladder fossa which continues to the posterior side with the sulcus for the inferior vena cava (IVC). The transverse fissure – the porta hepatic with the a. hepatica propria, portal vein and gallbladder duct [22].

R. Ger on the other hand describes four fissures: right, median, left and portoumbilical [17].

But besides the usually present fissures additional grooves can sometimes be found on the liver surface.

The accessory fissures have a tendency to disappear during postnatal period due to liver reformation. But sometimes they persist longer, in some cases even for the whole life [14].

The frequency of such anomalies ranges between 6% to 40%.

Y. H. Auh et al., 1984 describes the presence of accessory fissures in 25% of CT scans. They also indicate that the incident increases from patients aged 17-60 years to patients aged 61-84. Usually fissures are on the anteriosuperior surface – 63%. 8.5% of livers had more lateral fissures. 18.5% of the fissures were on the left lobe. Approximately one of three invaginations extends 2 cm or more into the liver parenchyma [2].

The accessory hepatic fissures are a great source of errors.

This can happen using CT scans and sonography. Supplementary CT can be helpful in evaluation. Multiple fissured liver can be confused with macronodular liver. It is important to mention that cirrhotic liver rarely has additional fissures [15].

A study performed by J. H. Lee, S. Y. Lee, D. W. Hwang, et al., 2012 showed that minor grooves of the liver are often observed in line with sectors and segments. This is more common for the right lobe rather for the left one. Additional sulci can be caused by diaphragm, pressure of the colon. Several authors indicate that they appear at the ramification zone of the portal vein [6].

It is presumed that sulci result from the unequal growth of the liver parenchyma. It can happen because of the unequal resistance of the muscle bundles of the diaphragm. Another theory based on the radiological and corrosion methods indicated that fissures can be marks of the hepatic "weak" zones. These zones have lower resistance compared to other parts of the organ [17].

V. Macchi et al., 2005 describes that diaphragmatic sulci can be found in 40% of autopsies. In young subjects this can be due to the pressure of the diaphragm which prevents liver growth in the so called "weak" zones. In adult this can be explained by the increase activity and strength of the diaphragm. In many of these cases hypertrophic diaphragmatic bundles were found. In 47% of cases right lobe fissures are multiple. Radiology confirms that accessory fissures correspond with the topography of the right, middle hepatic veins and their tributaries in 67% of cases [9, 10].

Zahn's grooves are deep grooves present on the upper surface of the liver. They are formed by hypertrophied diaphragm bundles and are present in 10% of the autopsies. They can be associated with obstructive pulmonary disease.

Corset liver is another anomaly formed by the pressure of rib cage in patients who wear a tight corset. But in this case the fissures are oriented transversely [1, 3].

It is important to indicate that accessory fissures are a far more common anomaly compared to accessory lobes. Accessory lobes are present only in 6% of livers [7].

Accessory fissures have an important clinical role. Some organ dysfunctions can be associated with this anomaly, such as gastric volvulus, diaphragmatic hernia and portal hypertension [14].

S. B. Nayak et al., 2012 indicates that collection of fluid in accessory fissures may easily be mistaken for a cyst, liver abscess or intrahepatic hematoma [8].

It is important to know about the sulci evaluating a patient with abdominal trauma. Accessory fissures can easily be mistaken for a lacerated liver. Also fissures can be useful during hepatic resection [19].

Material and methods

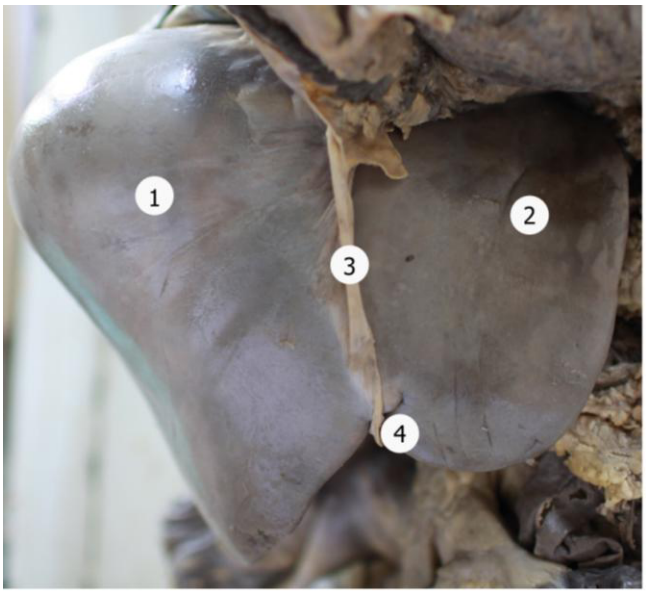
A review of studies of liver surface anatomy was performed regarding additional liver fissures and their clinical significance. Surface anatomy was studied on male organ complex using dissection methods of Б. З. Перлин. A case of multiple liver anomalies was described using morphometric methods [21].

Discussions and results

During a dissection of a male organ complex an unusual liver was found. It had two accessory fissures, Spiegel's lobe and an unusual cystic artery. The liver had a ventropetal orientation (fig. 1, 3). Spiegel's lobe is an anomaly, when an additional lobe is present on the liver surface which corresponds with the caudate lobe. It usually has two projections (fig. 4,5).

The first is called the papillary process, which forms the dorsal margin of the transverse fissure. The second is the caudate process which passes between two segments of the right sagital fissure.

Two accessory fissures were present on its surface: one on the upper lateral part of diaphragmatic surface of the right lobe. It measured 7,6 cm and extended 1 cm into the liver parenchyma (fig. 2). The second fissure divided the Spiegel's lobe into two halves. It measured 4,5 cm and extended 1,5 cm into the liver parenchyma (fig. 4).



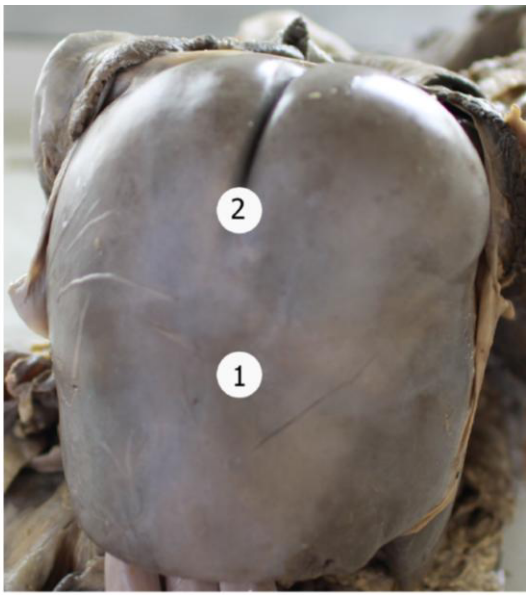


Fig. 1. Diaphragmatic surface of the liver.
1 – right liver lobe; 2 – left liver lobe; 3 – falciform ligament; 4 – round ligament. Macro specimen, male 60 years.

Fig. 2. Lateral part of diaphragmatic liver surface.
1 – right liver lobe; 2 – accessory liver fissure. Macro specimen, male 60 years.

The livers vascular anatomy was normal except for the gallbladder artery which had two separate origins: one from the common hepatic artery and the second from the gastroduodenal artery then uniting in a form of a triangle (fig. 4).

G. Guzun. and R. Turchin, 2012 indicate that in 95% of cases cystic artery originates as a single branch from the right hepatic artery (RHA). Other authors describe that it originates from RHA in 48-75%. The presence of an additional gallbladder artery is rather rare and ranges from 12-25% depending on the author. The origin of the artery can vary. Different authors indicate that it starts from the right hepatic artery in 74.7-89%, left hepatic 3-5.9%, common hepatic artery 5-14.9%, gastroduodenal artery 2-4%, and other arteries in 1-3%. It can also arise from pancreatoduodenal artery, right gastric artery and by a separate branch from the celiac trunk or superior mesentery artery [4, 12, 13, 18, 20].

D. Anupama et al., 2011 describes a case of two cystic arteries both of which started from the RHA. The second cystic artery can also have different points of origin and doesn’t necessarily start from the same artery as the first artery [12, 13].

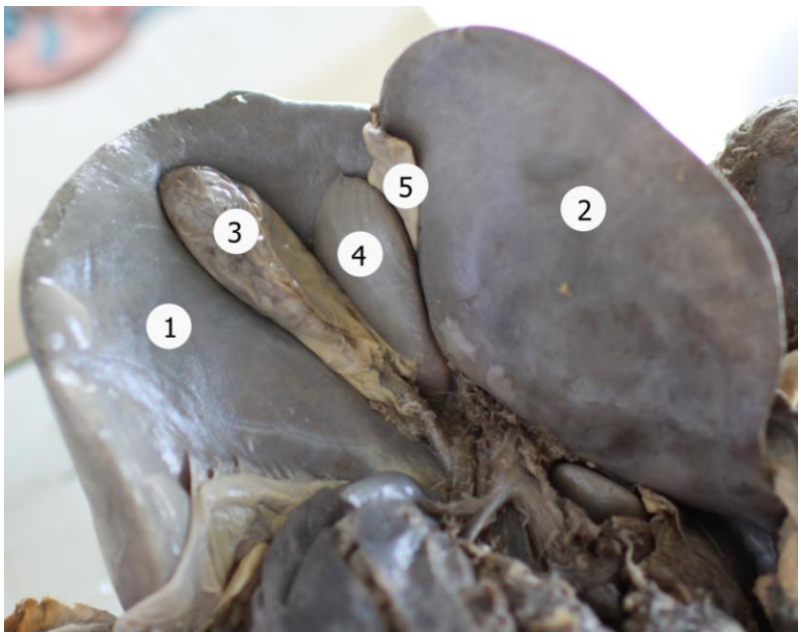


Fig. 3. Visceral liver surface.
1 – right liver lobe; 2 – left liver lobe; 3 – gallbladder; 4 – quadrate lobe; 5 – round ligament. Macro specimen, male 60 years.

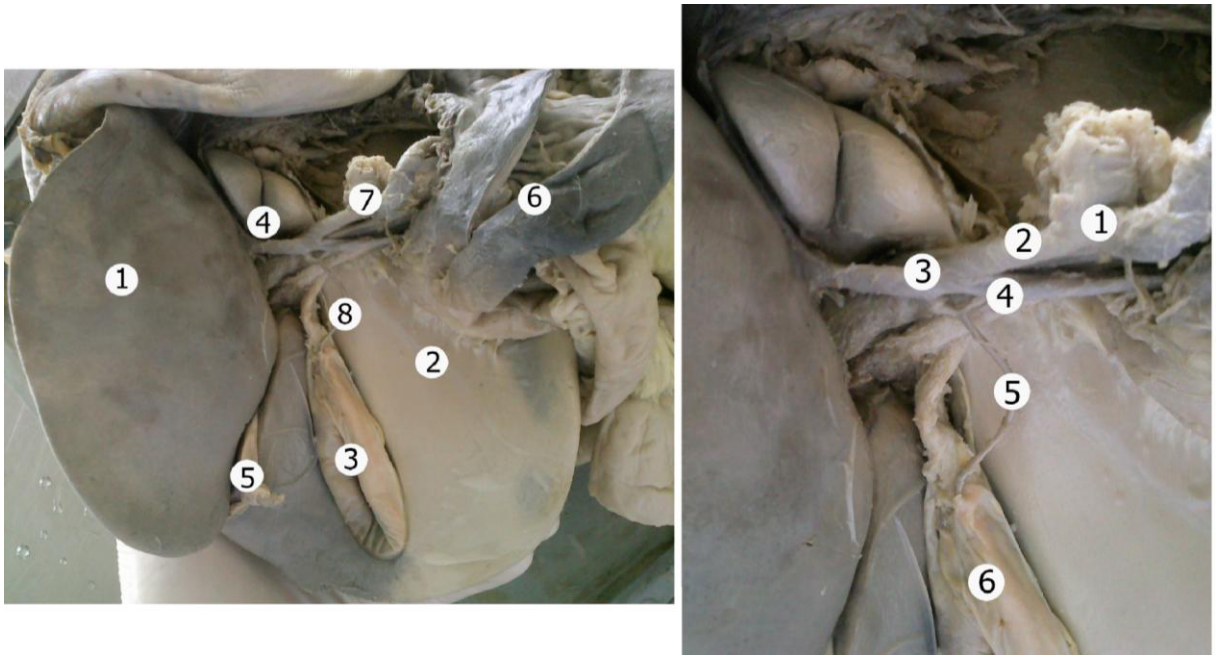


Fig. 4. Visceral liver surface.
1 – left liver lobe; 2 – right liver lobe; 3 – gallbladder; 4 – Spiegel's lobe; 5 – round ligament; 6 – stomach; 7 – celiac trunk; 8 – gallbladder artery. Macro specimen, male 60 years.

Fig. 5. Visceral liver surface, part of fig. 4.
1 – celiac trunk; 2 – common hepatic artery; 4 – gastroduodenal artery; 5 – gallbladder artery; 6 – gallbladder. Macro specimen, male 60 years.

Accessory liver fissures can mimic macronodular liver, cyst, liver abscess, intrahepatic hematoma or lacerations [19].

Accessory fissures can be caused by gastric volvulus, diaphragmatic hernia, portal hypertension, obstructive pulmonary disease, hypertrophic diaphragmatic bundles or rarely by the pressure of adjacent organs and structures (due to the fact that adjacent structures usually leave an impression but not a fissure) [5, 7, 16].

They can be markers of hepatic "weak zone" – an area with low vascularization which can be useful during resection [9, 10].

We presented a case of a liver with multiple anomalies such as two accessory fissures, Spiegel's lobe and an unusual cystic artery. The knowledge of such anomalies can be useful in different clinical situations surgical, as well as non-surgical.

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