

Accessory Lobes, Accessory Fissures and Prominent Papillary Process of the Liver

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ABSTRACT

Often unreported hepatic variations include accessory fissures, lobes and processes. Variant hepatic fissures further show variations in location and depth. Accessory lobes of the liver have different size, shape, situation, connection with maternal organ. These abnormalities in the anatomy of human liver have the unspecified clinical significance. We described four examples with a combination of accessory lobes, accessory fissures and prominent papillary processes. Clinicians should be aware of such variations to prevent diagnostic and therapeutic misadventures.

Keywords: Liver, Lobes, Fissures, Anomalies of development, Additional anatomical structures.

INTRODUCTION

Hepatobiliary congenital anomalies are common. These variations have largely been reported in the biliary tree and hepatobiliary vasculature. The liver also shows variations in its fissures, lobes and processes both on its visceral and diaphragmatic surfaces

(Vinnakota and Jayasree, 2013; Wahane and Satpute, 2015). Ectopic hepatic tissue has also been reported (Collan et al., 1978, Sakarya et al. 2002). We report four cases with the above listed abnormalities.

CASE REPORTS

Four formalin fixed livers with unusual anatomy were removed from adult human cadavers during routine dissection for medical undergraduate. Each liver lobe, was studied in detail for the size, shape, accessory fissures, and accessory structures.

Case 1

Accessory groove on the inferior surface of right lobe was found. It ran to the right from the porta hepatis. Papillary process of caudate lobe was prominent and looked like a tongue. Its tip directed to anterior part of the fissure between right and left lobe of the liver. The quadrate lobe had triangular appearance. There was a small outgrowth of the quadrate lobe, the accessory lobe. It was located close to groove separating big lobes of the liver (fig 1).

Case 2

The liver had triangular shape when viewed from the visceral surface. Hypoplasia of the left lobe was marked. The caudate lobe was well developed, with massive papillary process. The caudate process of the caudate lobe was situated like arc in the front of the inferior vena cava. The process was accentuated by accessory fissure. Another one accessory fissure recognized close to

gallbladder. Quadrate lobe had a triangular appearance, with accessory lobe. It resembled a pyramid with the facing anteriorly apex (fig 2).

Case 3

The right lobe of liver had two accessory fissures on the visceral surface. One started from porta of liver, other from gallbladder. Numerous outgrowths were discovered on the visceral side of the liver. They are named as small accessory lobules. Papillary process and caudate process of the caudate lobe were looked like an inverted "V" (fig 3).

Case 4

The caudate lobe of the liver had a prominent voluminous papillary process, and caudate process. It was a straight beam of the liver tissue, running to the right between inferior vena cava and portal vein. The caudate process was bounded by accessory fissure. The quadrate lobe had an accessory lobe, looked like tongue and extending the lower edge of the liver (fig 4, 5). Thus, in our research we described a combination of accessory lobes, accessory fissures and well-developed papillary and caudate processes in the one organ. This set of liver anomalies occurring at the same time is a rare

anatomical finding according to literature review.

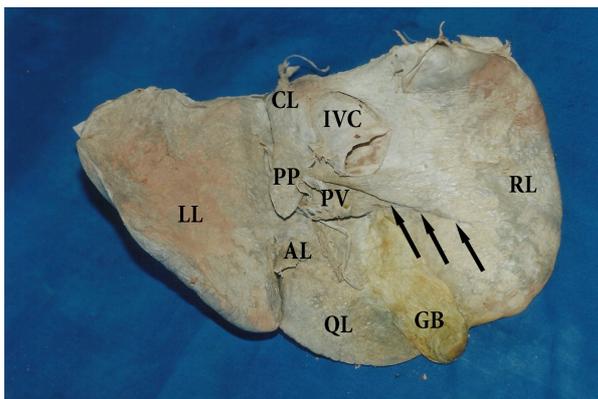


Figure 1: Case 1. LL – the left lobe of the liver, RL – the right lobe of the liver, CL – the caudate lobe, QL – the quadrate lobe, PV – the portal vein, IVC – the inferior vena cava, GB – the gallbladder, AL – the accessory lobe, PP – the papillary process. Arrows show the additional groove of the liver.

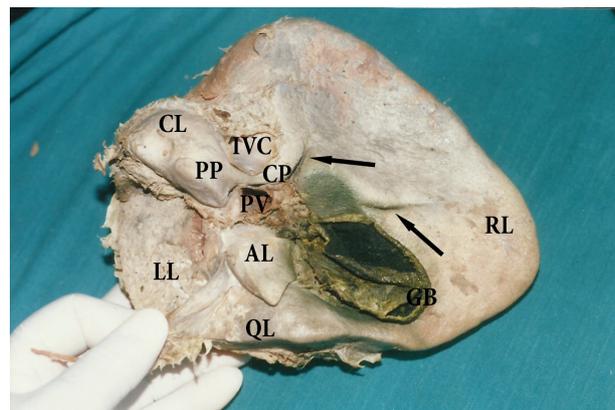


Figure 2: Case 2. LL – the left lobe of the liver, RL – the right lobe of the liver, CL – the caudate lobe, QL – the quadrate lobe, PV – the portal vein, IVC – the inferior vena cava, GB – the gallbladder, AL – the accessory lobe, PP – the papillary process, CP – the caudate process. Arrows show the accessory fissures of the liver.

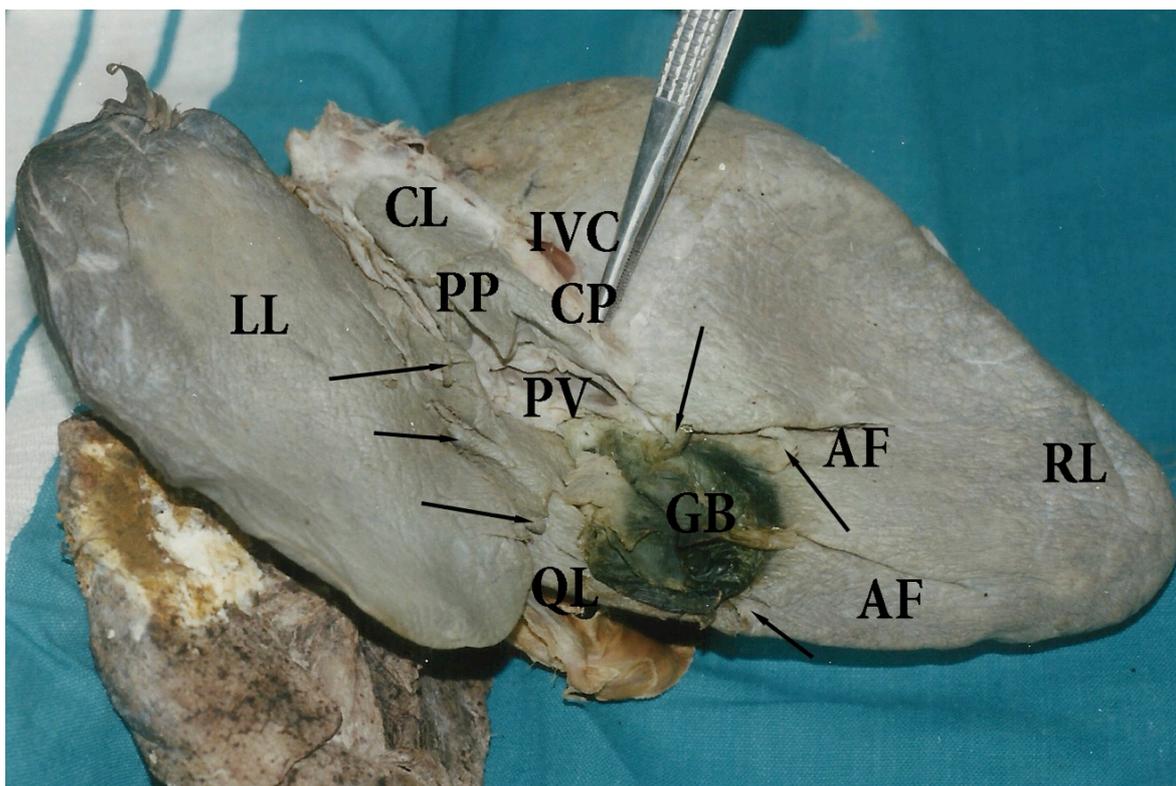


Figure 3: Case 3. LL – the left lobe of the liver, RL – the right lobe of the liver, CL – the caudate lobe, QL – the quadrate lobe, PV – the portal vein, IVC – the inferior vena cava, GB – the gallbladder, AL – the accessory lobe, PP – the papillary process, CP – the caudate process, AF – the additional fissure. Arrows show the accessory lobes of the liver.

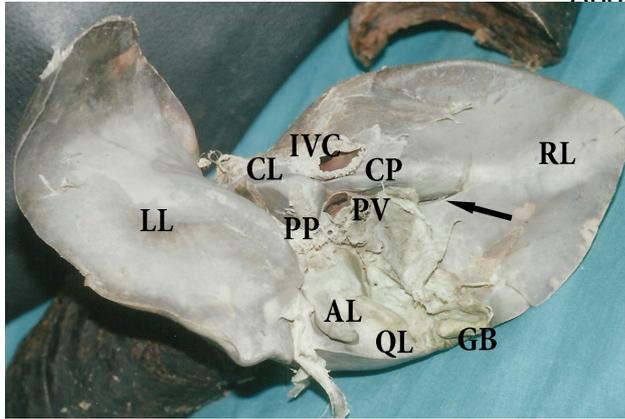


Figure 4: Case 4. LL – the left lobe of the liver, RL – the right lobe of the liver, CL – the caudate lobe, QL – the quadrate lobe, PV – the portal vein, IVC – the inferior vena cava, GB – the gallblader, AL – the accessory lobe, PP – the papillary process, CP – the caudate process. Arrow shows the accessory fissure of the liver.

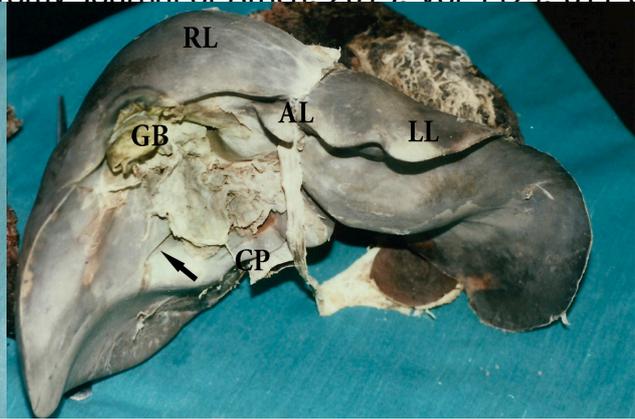


Figure 5: Case 4. LL – the left lobe of the liver, RL – the right lobe of the liver, GB – the gallblader, AL – the accessory lobe, PP – the papillary process. Arrow shows the accessory fissure of the liver.

DISCUSSION AND REVIEW

Anatomical variations or congenital abnormalities of the liver are related most commonly to the biliary tree and vascular system changes of the liver. Additionally, liver anomalies include accessory fissures and accessory lobes (Shetty et al., 2011; Nayak, 2013; Vinnakota and Jayasree, 2013; Wahane and Satpute, 2015). They are found and described more often after death than in life. Accessory sulci are usually located on visceral and/or diaphragmatic surfaces of the liver, on the right and/or left lobe of it (Martinoli et al., 1992; Ono et al., 2000; Macchi et al., 2003; Othman et al., 2008; Mehta et al., 2010; Macchi et al., 2013). Auh et al. (1984) and Joshi et al. (2009) state, that additional grooves were more common in the right lobe.

Accessory lobes of the liver vary in size (Collan et al., 1978; Kostov and Kobakov 2011; Wang et al., 2012; Nayak et al., 2013). Accessory liver tissue is often connected to the main organ, although cases that are completely separate from the normal liver have been reported (Collan et al., 1978; Stattaus et al., 2008). Collan et al. (1978), Sakarya et al. (2002) also reported on ectopic liver tissue, which is situated outside the liver without any relations with it, is attached to the gallbladder or intra-abdominal ligaments. These ectopic tissue can be found in the thoracic, abdominal or

pelvic cavities (Levi et al., 1969; Smiley et al., 2013; Shrestha et al., 2014).

A prominent papillary process of the caudate lobe has also been reported (Joshi et al., 2009; Singh, 2013). Conjunction of all listed above liver abnormalities in one organ was not been clearly demonstrated.

The abnormalities in the anatomy of human liver have the unquestionable clinical significance. Normally, invagination of peritoneum (Lim et al., 1987; Siegel, 2011) or action of diaphragmatic muscle bundles and ribs (Macchi et al., 2003) produce the accessory fissures. Pathologic sulci of the liver occur as a result of traumatic or iatrogenic causes, and of liver cirrhosis (Auh et al., 1994). Accessory grooves of the liver on the ultrasonography should be differentiated from the major hepatic grooves and from pathologic liver lesions (Auh et al., 1984; Mehta et al., 2010). Additional fissures mimic pathologic liver nodules on CT (Auh et al., 1984). Hepatic capsular retraction adjacent to hepatic tumour can be mistaken for cases of pseudoretraction of the hepatic capsule, including accessory fissure (Yang et al., 2002). According to Auh et al. (1994) accessory sulci can be spaces of pathological fluid loculation when ascites, hemoperitoneum, or infected ascites. In this case they are becoming recesses and can be mistaken for a liver cyst, intrahepatic

hematoma, or liver abscess. Also additional grooves of the liver can serve as points of implantation for peritoneally disseminated tumor cells. Accessory sulci can be confused with intrahepatic focal lesions. The prominent papillary process of the caudate lobe of the liver mimic lymph nodes or a pancreatic mass on ultrasonographic picture of the liver. Enlarged papillary processes are more frequently seen in patients with chronic liver disease (Donoso et al., 1989). Accessory liver lobe is the outcome of an abnormal development of liver tissue during embryologic period. In some cases, it is secondary to a trauma or a surgical operation (Tancredi et al., 2010). Parke et al. (1996) compare the adult and prenatal livers. Accessory lobes are very rare in adult organs. However, they are a relatively common occurrence in the perinatal cases, as are also hypertrophic papillary processes, and marked accessory fissures. It was concluded that most ectopic lobes, hypertrophic caudate lobe extensions, and accessory fissures disappear during postnatal changes of the liver, because the liver undergoes considerable postnatal reformation. An accessory lobe of liver is a congenital anomaly, which can be present as acute surgical emergency due to torsion. It is rarely diagnosed preoperatively. Acute abdominal pain with vomiting is common clinical symptom. Because of it is nonspecific sign, findings of an accessory lobe torsion ordinary

occur at laparotomy, autopsy and in the radiological investigations. (Khandelwal et al., 2013; Shrestha et al., 2014). Accessory lobes also stimulate tumor. Depending on the location, additional liver lobe can mimic an intra-abdominal, pelvic and intra-thoracic (particularly lung) tumors. The diagnosis can be established by a biopsy under guidance of radiological examination. Often, accessory lobe of the liver in this case is intraoperative finding (Stattaus et al., 2008; Wang et al., 2012). As in agreement with what Arakawa et al. (1999) write, the ectopic liver is more prone to hepatocarcinogenesis, than the mother liver.

Thereby, abnormalities of the liver can cause diagnostic difficulties and confusions during procedures like biopsy.

They mimic tumors, liver lesions. An accessory lobe can be present as acute surgical emergency (acute abdomen) due to torsion.

In conclusion, information about anomalies of liver, such as additional lobes, accessory fissures, well-developed papillary process, may be used by clinicians for the diagnosis, correct interpretation of radiographs and management of hepatic diseases. Thus, complete picture of the liver surface anatomy may prevent a misdiagnosis of hepatic disease and, as a consequence, errors in treatment.

REFERENCE

1. Auh YH, Rosen A, Rubenstein WA, Engel IA, Whalen JP, Kazam E. 1984. CT of the papillary process of the caudate lobe of the liver. *Am J Roentgenol* 142:535-538.
2. Auh YH, Rubenstein WA, Zirinsky K, Kneeland JB, Pardes JC, Engel IA, Whalen JP, Kazam E. 1984. Accessory fissures of the liver: CT and sonographic appearance. *Am J Roentgenol* 143(3):565-572.
3. Collan Y, Hakkiluoto A, Hastbacka J. 1978. Ectopic liver. *Ann Chir Gynaecol* 67:27-29.
4. Donoso L, Martinez-Noguera A, Zidan A, Lora F. 1989. Papillary process of the caudate lobe of the liver: sonographic appearance. *Radiology* 173:631-633.
5. Joshi SD, Joshi SS, Athavale SA. 2009. Some interesting observations on the surface features of the liver and their clinical implications. *Singapore Med J* 50:715-719.
6. Khandelwal KK, Gomes RM, Bhagvat V. 2013. Torsion of pedunculated accessory liver lobe with acute acalculous cholecystitis. *Indian J Surg* 75(Suppl 1):145-147.
7. Korn MA, Mostbeck GH, Tscholakoff D. 1991. Papillary process of the caudate lobe – erroneous sonography interpretation as a space-occupying lesion. *Ultraschall Med* 12:197-200.
8. Kostov DV, Kobakov GL. 2011. A large accessory liver lobe. *HPB (Oxford)* 13(10):757.

9. Levi MM, Creque LC, Cinque S. 1969. Accessory lobe of liver presenting symptoms of pelvic tumor. *N Y State J Med* 69:1334-1336.
10. Lim JH, Ko YT, Han MC, Kim CW, Choi BI, Im JG. 1987. The inferior accessory hepatic fissure: sonographic appearance. *Am J Roentgenol* 149:495-497.
11. Macchi V, Feltrin G, Parenti A, De Caro R. 2003. Diaphragmatic sulci and portal fissures. *J Anat* 202(Pt 3):303-308.
12. Macchi V, Porzionato A, Stecco C, Parenti A, Newell RL, De Caro R. 2013. Sulci of the liver found after death: Their nature and potential teaching value. *Clin Anat* 26:592-597.
13. Martinoli C, Cittadini G, Conzi R, Pastorino C, Neumaier CE, Rollandi G, Grozio G, Garlaschi G. 1992. Sonographic characterization of an accessory fissure of the left hepatic lobe determined by omental infolding. *J Ultrasound Med* 11:103-107.
14. Massaro M, Valencia MP, Guzman M, Mejia J. 2007. Accessory hepatic lobe mimicking an intra-abdominal tumor. *J Comput Assist Tomogr* 31:572-573.
15. Mehta V, Arora J, Manik P, Suri RK, Rath G. 2010. Clinico-anatomical aspects of accessory fissures obscuring the normal hepatic morphology. *Clin Ter* 161:259-260.
16. Naganuma H, Ishida H, Niizawa M, Morikawa P, Masamune O, Kato T. 1993. Intrathoracic accessory lobe of the liver. *J Clin Ultrasound* 21:143-146.
17. Nayak BS. 2013. A study on the anomalies of Liver in the South Indian cadavers. *Int J Morphol* 31:658-661.
18. Nayak SB, Kumar N, Sirasanagandla SR, Shetty SD. 2013. A mini accessory liver lobe in the fissure for ligamentum teres and its clinical significance: a case report. *J Clin Diagn Res* 7:2573-2574.
19. Negru D, Tudorache C, Marinescu M, Grigoras M, Crumpei F, Georgescu S. 2007. Torsion and infarction of an accessory liver lobe. *Rev Med Chir Soc Med Nat Iasi* 111:442-445.
20. Omanik S, Jablonsky I. 1972. Pedunculated accessory hepatic lobe. *Arch Surg* 105:792-794.
21. Ono ML, Murakami G, Sato TJ, Sawada K. 2000. Hepatic grooves and portal segmentation. *Kaibogaku Zasshi* 75:517-523.
22. Othman FB, Latiff AA, Suhaimi FH, Das S. 2008. Accessory sulci of the liver. An anatomical study with clinical implications. *Saudi Med J* 29:1247-1249.
23. Pampari D, Lacerenza C. 1961. Intrathoracic ectopy of an accessory lobe of the liver. *Archivio Chir Torace* 18:557-565.
24. Parke WW, Settles HE, Bungler PC, Van Demark RE. 1996. Malformations of the liver: some prenatal and postnatal developmental aspects. *Clin Anat* 9:309-316.
25. Perez-Martinez A, Conde-Cortes J, Martinez-Bermejo MA, Bento-Bravo L. 2006. Torsion of a pedunculated accessory hepatic lobe: differential diagnosis of projectile vomiting in a neonate. *J Perinat Med* 34:248-249.
26. Reuther G. 1992. An unclear space-occupying lesion in the portocaval space. A hypertrophied papillary process in the caudate lobe of the liver. *Radiologe* 32:407-408.
27. Rodriguez-Perez D. 1955. Accessory intrapleural ectopic liver lobe. *Bol Asoc Med P R* 47:353-356.
28. Ruiz Hierro C, Vazquez Rueda F, Vargas Cruz V, Lasso Betancor CE, Ayala Montoro J. 2013. Focal nodular hyperplasia on accessory lobe of the liver: preoperative diagnosis and management. *J Pediatr Surg* 48:251-254.
29. Sakarya A, Erhan Y, Aydede H, Kara E, Ilkgul O, Ciftdogan C. 2002. Ectopic liver (choristoma) associated with the gallbladder encountered during laparoscopic cholecystectomy: a case report. *Surg Endosc* 16:1106.
30. Shetty S, Lakshmi Kantha BM, Jayanthi V, Sheshgiri C. 2011. A study of variant external features on cadaveric livers. *Anatomica Karnataka* 5:12-16.
31. Shrestha MK, Ghartimagar D, Ghosh A. 2014. Accessory hepatic lobe in right lumbar region - an incidental finding. *J Nepal Health Res Counc* 12:203-204.
32. Siegel MJ. 2011. *Pediatric Sonography*, 4th ed. Philadelphia: Lippincott Williams & Wilkins. p 226.

33. Smiley K, O'Keefe S, Rasner JN, Iocono JA. 2013. Thoracoscopic resection of an intrathoracic accessory liver lobe: an incidental finding in the workup of a child with a respiratory infection. *J Pediatr Surg* 48:1618-1620.
34. Stattaus J, Kuhl H, Forsting M. 2008. Diagnosis of an accessory liver lobe established by magnetic resonance imaging-guided core biopsy. *Z Gastroenterol* 46:351-354.
35. Tancredi A, Cuttitta A, De Martino DG, Scaramuzzi R. 2010. Ectopic hepatic tissue misdiagnosed as a tumor of lung. *Updates Surg* 62:121-123.
36. Vinnakota S, Jayasree N. 2013. A new insight into the morphology of the human liver: a cadaveric study. *ISRN Anat*: 689564.
37. Wahane A, Satpute C. 2015. Normal morphological variations of liver lobes: a study on adult human cadaveric liver in Vidarbha region. *International Journal of Science and Research* 4:814-816.
38. Wang C, Cheng L, Zhang Z, Xie T, Ding H, Deng Q, Yuan Z. 2012. Accessory lobes of the liver: A report of 3 cases and review of the literature. *Intractable Rare Dis Res* 1:86-91.
39. Wang Y, Junlin L, Zhang WG, Chen JH, He Y, Chen JM. 2010. Accessory lobe of right liver mimicking a pulmonary tumor in an adult male. *Ann Thorac Surg* 89:9-10.
40. Yang DM, Kim HS, Cho SW. 2002. Pictorial review: various causes of hepatic capsular retraction: CT and MR findings. *Br J Radiol* 75:994-1002.