



Review article

Examining the liver – Revisiting an old friend

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ABSTRACT

In the current era of medical practice, super saturated with investigations of choice and development of diagnostic tools, clinical examination is a lost art. In this review we briefly discuss important aspects of examination of the liver, which is much needed in decision making on investigational approach. We urge the new medical student or the newly practicing physician to develop skills in clinical examination for resourceful management of the patient.

KEYWORDS: Liver, examination, clinical skills, hepatomegaly, chronic liver disease, portal hypertension, liver span

INTRODUCTION

The liver attains its adult size by the age of 15 years. The liver weighs 1.2 to 1.4 kg in women and 1.4 to 1.5 kg in men. The liver seldom extends more than 5 cm beyond the midline towards the left costal margin. During inspiration, the diaphragmatic exertion moves the liver downward with anterior surface rotating to the right. In normal effort

respiration, the excursion of liver movement is around 2 to 3 cm. Castell and Frank has elegantly described normal liver span in men and women utilizing the percussion method (**Table 1**). Accordingly, the mean liver span is 10.5 cm for men and 7 cm in women. During examination, a span 2 to 3 cm larger or smaller than these values is considered abnormal.[1]

Table 1: Normal liver dullness in men and women based on percussion alone

<i>Liver Dullness (cm)</i>				
Height (inches)	Midclavicular		Midsternal	
	<i>Men</i>	<i>Women</i>	<i>Men</i>	<i>Women</i>
60	8.25	6.00	6.00	4.00
63	9.00	6.75	6.50	4.50
66	9.75	7.50	7.00	5.00
69	10.25	8.00	7.50	5.50
72	11.00	8.75	8.00	5.75
75	11.75	9.50	8.50	6.25

From: Castell DO, Frank BB. Abdominal examination: role of percussion and auscultation. *Postgrad Med* 1977; 62(6):131-34.

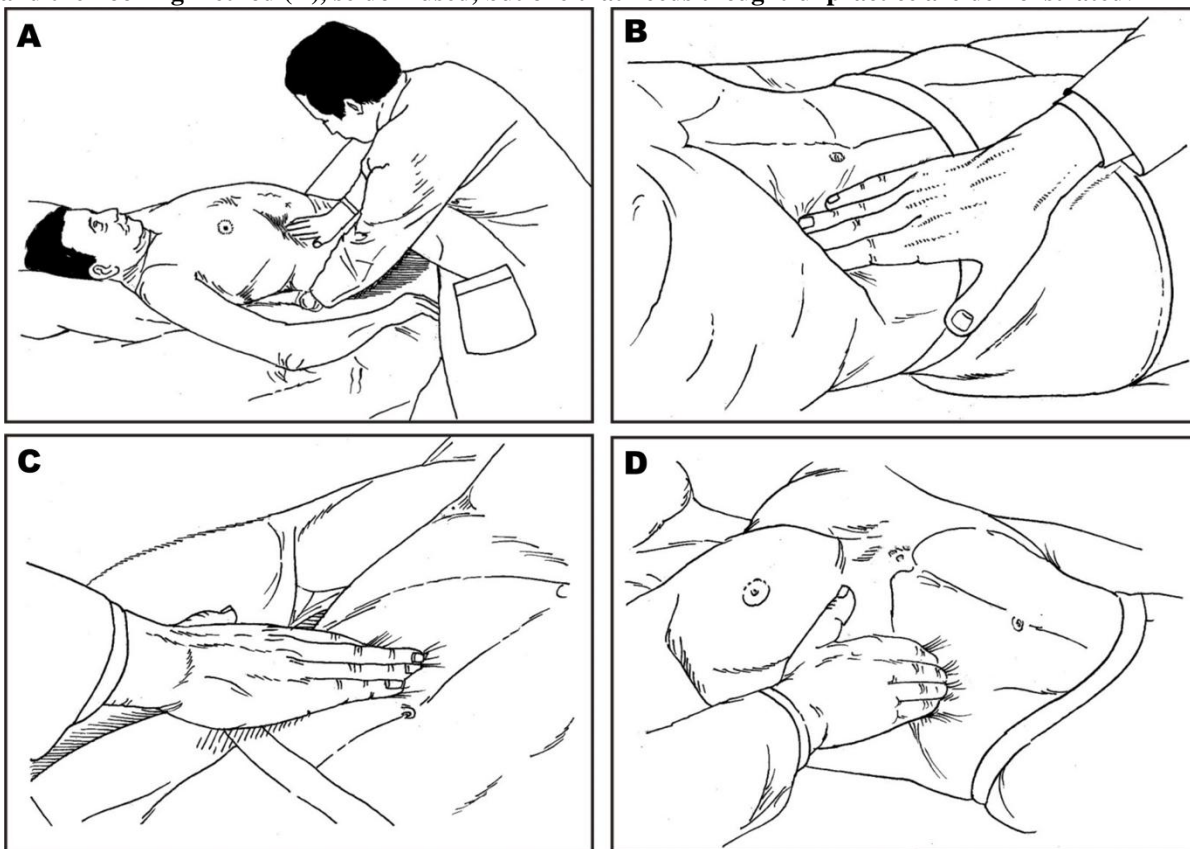
General Overview of the Examination

The patient in recumbent position, a right handed examiner must be on the right side of the patient. Explain to the patient the simple components of the examination before starting. The patient should be relaxed and avoid tensing of the abdominal musculature. The knees can be flexed or a pillow kept underneath the knees to promote abdominal wall relaxation. Inspection, from a liver point of view is important. An enlarged liver's inferior border can be visible sometimes, in thinly built patients. Fullness over the right upper quadrant also suggests liver enlargement. Palpation elicits the liver consistency, surface and borders. It can also help notice rubs and bruit. Percussion helps in determining the liver span and lower border of the liver. Auscultation is useful to confirm the lower edge of liver, using the 'scratch test' and the presence of bruit or rubs.[2]

Palpation

Palpation starts in the right lower quadrant using the flat of the hand or fingers and never just the finger tips. The left can be slid and placed posteriorly in the right side to help elevate the solid organ. (**Figure 1A**)The patient must be breathing gently and slowly, so that the liver edge is brought downwards towards the examining tips. Keep the fingers in place until one full cycle of respiration is complete and an enlarged liver border is not missed (**Figure 1B**) while hurrying the proximal movement of the examining hand. At the end of each exhalation, the fingers are moved up towards the shoulder region; by about 2 cm. During the upward movement, the fingers will slip over the edge of the palpable liver.

Figure 1: Methods of palpation of the liver. The importance of placing the left hand posteriorly, to palpate anteriorly (A); accurate application of finger tips along the edge that needs to be felt in the right hypochondrium (B) and epigastrium (C); and the hooking method (D), seldom used, but one that needs thoughtful practice are demonstrated.



All palpable livers are not enlarged. Hepatomegaly is considered if liver span is above 12 to 13 cm. Palpation of the liver edge helps in assessment of more details regarding the liver. These include – consistency (soft, firm, hard), surface (smooth, nodular), margins (sharp, round), presence or absence of tenderness, pulsatility. A soft round edge is normal. Sharp, well defined edge is seen in cirrhosis. A firm smoothness suggests congested or infiltration of liver. Hard consistency is seen in primary or secondary malignancy involving liver. Some clinicians assess the whole 'palpable surface'.

There is *no* dictum that states that a firm liver has to have a sharp margin. Number and size of nodules and consistency differences between different areas on palpation in a known

patient can help understand a new pathology that has evolved during the course of illness. Half of all palpable livers are not enlarged. In the presence of a palpable liver edge, the likelihood of hepatomegaly is 2.5 while the likelihood of sonography estimating hepatomegaly with a clinically non-palpable liver edge is 0.45. Once the edge of the liver is palpable, the examiner should make sure that the position of the palpating finger is in the mid clavicular line (MCL).

For the sake of universal acceptance in clinical methodology, the MCL is considered the land mark in liver examination. Palpation of the liver edge should also include description on whether left, right or both lobes edges are felt. While palpating the right quadrant and the epigastric

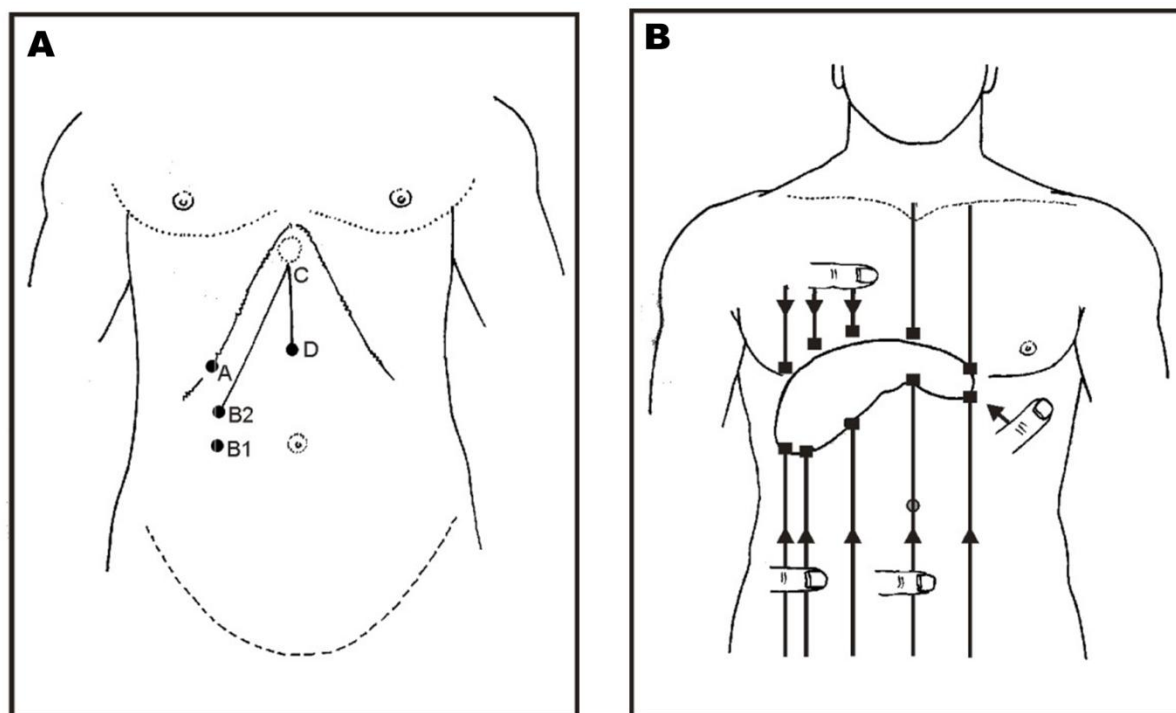
region, the examiner's fingers should be parallel to the anatomically defined edges of the liver. While in the epigastric region, during palpation, some clinicians prefer placement of the fingers parallel to the rectus muscle instead of the anatomical liver edge (**Figure 1C**) – this helps in reduction of confusion that occurs between palpation of the rectus muscle and underlying liver. Palpation of the liver edge can be done single headedly (in lean patients) or with two hands (in overweight patients). In bimanual palpation, the left hand is held posteriorly between the 12th rib and iliac crest, lateral to the paraspinous muscles.

The posterior aspect is then lifted up gently to elevate the liver to a more easily accessible anterior position. The examiner's hand is moved along the liver edge to outline the

liver enlargement in the horizontal plane and also to palpate for bilobar enlargement. Documentation of an enlarged liver is to be made as 'x' cm below the right costal margin or the MCL and/or 'y' cm below the xiphisternum. The normal liver is slightly tender on palpation. Another alternative for liver palpation is the 'hooking method' (**Figure 1D**).

In this method, the examiner hooks his fingertips around the costal margin and asks the patient to inspire deeply to bring the liver edge down. This is a useful method to assess liver consistency and edges in patients with normal liver size. After ascertaining the palpatory findings (**Figure 2A**) and in the presence of a palpable liver edge, the next important aspect is assessment of liver span, utilizing percussion technique.[3 – 6]

Figure 2: Percussion of the liver and landmarks. The important measures during percussion and clinical evaluation of an enlarged liver are shown.

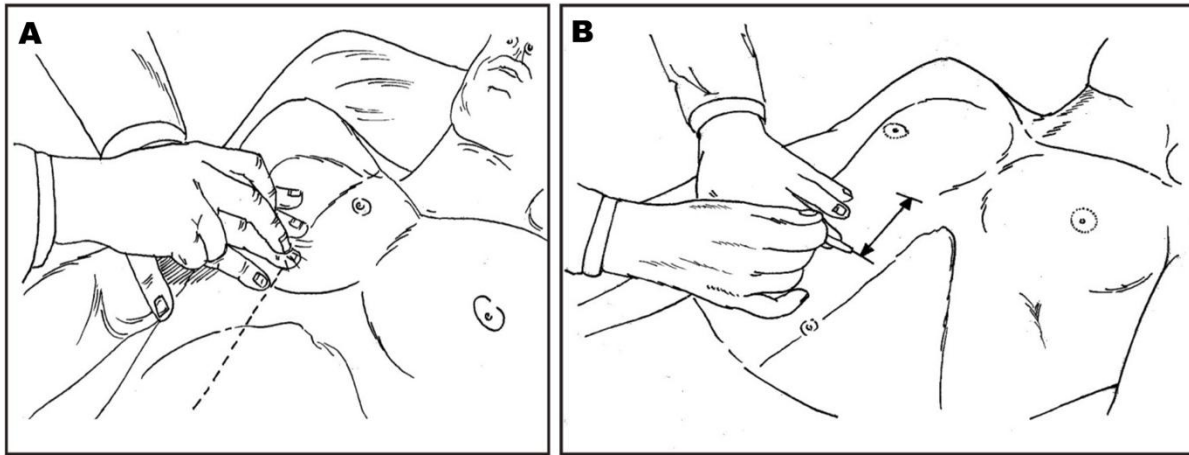


Percussion

Once the liver edge is palpated, then in the MCL plane, starting at the 3rd intercostal space, the examiner begins percussion downwards with the pleximeter finger placed horizontally. Moving the finger one rib space down after each percussion, at one point will yield dullness or a change in tone, which is the defining point of upper part of the liver. This change in tone/dullness will increase gradually as the percussion moves caudally. (**Figure 2B**) To conform the increased dullness, 2 or 3 fingers can be spread over consecutive rib spaces and percussion repeated over these regions to and fro to ascertain the position of/and change in tone of percussion.

The lower palpated edge of liver and the upper border of liver on percussion is marked using a skin pencil and the distance between two points measured (**Figure 3A and 3B**). This is the liver span in the MCL. In cases where the lower edge is not palpable, but there is a strong suspicion of underlying liver disease, then a gentle percussion method from the 3rd rib space all the way down to the right iliac fossa and painstakingly clarifying the spread of dullness, followed by measurement is also done by some clinicians. Alternatively, a thorough continuous firm percussion can also ascertain the liver span. In patients with large right sided pleural effusion, percussing the upper border of the liver becomes difficult.[7]

Figure 3: Accurate application and measures in percussion of the liver dullness and thereby the liver span is demonstrated.



Auscultation

Auscultation helps in eliciting rubs, hums and bruits over the liver or over the abdomen in associated conditions with liver disease. Excessive time spend on auscultation of the liver has little utility in actual clinical practice. A hepatic bruit is heard in less than 10% of patients with hepatoma and also sometimes heard in alcoholic hepatitis. In the former, sometimes, a diastolic component to the bruit can be heard commonly. Venous hums have lower pitch, are soft in volume, continuous, with systolic accentuation without localization, almost always changes in character and intensity with changes in posture, is louder during inspiration and diminishes when pressure is applied with a stethoscope. An arterial bruit is louder in pitch, is not continuous – has a systolic or a systolic or diastolic component, is more localized, does not change in character with postural changes and does not diminish or disappear with pressure application with a stethoscope.

Hepatic rubs are palpatory as well as auscultatory findings and should be mentioned in both instances, if felt/heard. It can be heard in post percutaneous liver biopsy patients and also any infection or inflammation that irritates and expands the Glissonian capsule. [8, 9] One important aspect in auscultation of the liver is what modern physicians forget about – The Scratch Test, used to define the lower liver edge in difficult to palpate patients. Placing the stethoscope above the costal margin in the MCL on the right side, a finger (scratching act) is moved cephalad starting from the right lower quadrant. The point where the transmitted sound changes, defines the lower liver edge. Scratch test is less accurate than palpation alone, but when the stethoscope is placed over the xiphisternum rather than just above the costal margin and they looked at the scratch test in isolation.[10]

The usefulness of a clinical test is assessed using pre-test probabilities – to obtain the test's positive and negative likelihood ratios. It has been reported that a palpable liver has a positive likelihood ratio of 2.5 for hepatomegaly and a negative likelihood ratio of 0.45. Generally, diagnostic tests with a likelihood ratio greater than 10 or less than 0.1 have high yield that affects changes in the probability of disease and are therefore considered potentially diagnostic. Tests

with likelihood ratio greater than 2 or less than 0.5 will make only a modest change in the probability of disease; however, are important contribution in certain situations.

CONCLUSION

A palpable liver is not necessarily enlarged or diseased but does increase the likelihood of hepatomegaly. The vertical liver span and overall clinical context must also be considered. Conversely, a non-palpable liver edge does not rule out hepatomegaly but does reduce its likelihood. Sequential clinical liver assessments for example, in fulminant hepatic failure or during treatment of hepatic metastases may help in understanding the progression of disease. Bedside clinical examination of the patient is very important in assessing for the next best resourceful investigation that needs to be performed for a rational diagnosis and is an art, that should never give way to modern diagnostics.

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