



## Clinical and Sonographic Estimation of Liver Span in Normal Healthy Adults

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### ABSTRACT

**Background:** Significant difference exists between clinical and ultra-sonographic liver span in the MCL in the subjects. **Aim:** To measure liver span in normal healthy adults clinically and by using ultrasonography. **Materials and Methods:** The study was conducted on 100 healthy subjects aged 18-65 years. Liver span was calculated by clinical examination followed by USG evaluation. **Results:** The mean clinical liver span measured in mid-clavicular line in males was 11.99 cm  $\pm$  1.6 cm and in females it was 11.05 cm  $\pm$  1.5 cm. Ultra-sonographic mean liver span in males was 14.16 cm  $\pm$  1.32 cm while in females it was 12.79 cm  $\pm$  1.40 cm. **Conclusion:** Significant difference was found between clinical and ultra-sonographic liver span in the MCL in the subjects ( $p < 0.001$ ).

**Keywords:** Liver span, mid clavicular line, ultrasonography

### INTRODUCTION

Liver is a large, solid gland that occupies the whole of right hypochondrium, greater part of epigastrium and extends into the left hypochondrium reaching up to left lateral line. Liver weighs about 1400 gm to 1600 gm in males and about 1200 gm to 1400 gm in females [1].

Alterations in the size of the liver occur in a wide variety of clinical conditions. It increases in some diseases like viral hepatitis, alcoholic liver disease, congestive cardiac failure, certain storage, and metabolic disorders, etc. and may diminish in some conditions as in acute fulminant hepatitis, cirrhosis, etc. or remain unchanged in number of diseases. So, assessment of liver size is a very important diagnostic clue for some diseases [2].

Numerous attempts have been made to develop an objective and reliable method for evaluation of liver size. Clinically by palpation and percussion, radiologically that is by screening and skiagraphy, by computerized tomographic scanning by radioisotope scanning and ultrasound scanning [2].

Routinely the liver enlargement is expressed by centimetres or fingers palpable below the right costal margin. Palpability of liver below thoracic cage still constitutes the common method for assessing its size. Liver size is best estimated clinically by liver span. The vertical distance between uppermost and lowermost points of hepatic dullness estimated by percussion in the right midclavicular line is the liver span [3].

These two techniques of estimating liver size that is clinically by percussion and palpation and radiologically by USG have their own advantages and disadvantages. Upper border of liver when lies behind the rib cannot be estimated by percussion and also due to pleural recess on right side, the liver span is underestimated if determined by percussion method alone. While USG, despite its widespread popularity is still to reach the far-flung villages where a medical practitioner must solely rely upon the good old method of percussion to distinguish between normal and abnormal liver size [2].

## REVIEW OF LITERATURE

Naegeli gives the height of liver dullness in the right midclavicular line as 11 cm, in the right parasternal line as 8 cm. A deviation of 2 cm either way in these measurements indicates an enlargement or a reduction respectively of the liver [4]. According to Naftalis and Leevy, liver size can be estimated by percussion and variability of measurements between examiners were due to differences in percussion techniques [5]. Peternel, et al. [6] studied 21 adults without clinical or laboratory evidence of liver disease and found that upper border of liver as determined by percussion was generally lower than determined by scanning. Sometimes detection of upper border of the liver becomes difficult to locate due to right sided pleural effusion or in painful condition of the chest. Similarly, lower border may be difficult to palpate and percuss in abdominal distention due to ascites and other causes [6].

## MATERIALS AND METHODS

The study was conducted on 100 healthy subjects aged 18-65 years with BMI 18.5 kg/m<sup>2</sup> to 24.9 kg/m<sup>2</sup> including attendants of patients, medical and paramedical personnel in Rajindra Hospital, Patiala.

The study was approved by the committee of medical ethics at Rajindra Hospital, Patiala.

The subjects should not have clinical evidence of any hepatic pathology, cardiovascular disease, liver infection, lymphoma or leukaemia, intestinal perforation and should not be alcoholic, overweight, and underweight.

All taking informed consent, data was collected and arranged in groups to determine the liver span by clinical examination followed by USG evaluation.

MCL line was determined by Da Costa's definition as cited by David Rytand as midclavicular line [7], let fall from the middle of the Clavicle.

In clinical examination, the person was made to lie flat with legs flexed and asked to relax. Then attempts to palpate the liver were made. If the liver was palpable, lower border in right MCL was marked. If the lower border was not palpable it was assessed by percussion in the same phase of respiration and marked. Upper border was found by percussion and was also marked by skin pencil in the right MCL. The vertical distance between the uppermost and lowermost points of hepatic dullness in the right MCL line was taken as the liver span.

Immediately after the percussion values were recorded USG evaluation was performed in the same plane on Philips Envisor whole body MC-15601 ultrasound machine in the Department of Radiodiagnosis, Government Medical College and Rajindra Hospital, Patiala using real time scanning system with 5.0 MHz frequency transducers; liver span was measured as the distance between the dome of the liver and inferior edge from the Polaroid image of the USG as described in "Ultraschalldiagnostik" [8].

The data statistically analysed. The statistical analysis was carried out using Statistically Package for Social Sciences (SPSS Inc., Chicago, IL, version 15.0 for Windows).

## OBSERVATIONS AND RESULTS

Figure 1 shows sex distribution of study cases whereas Figures 2, and 3 indicate liver measurements by clinical and USG methods. Figure 4 gives comparison between clinical and ultra-sonographic methods. Correlation is indicated in Table 1.

The mean clinical liver span measured in mid-clavicular line was 11.64 cm  $\pm$  1.7 cm while in males it was 11.99 cm  $\pm$  1.6 cm and in females it was 11.05 cm  $\pm$  1.5 cm.

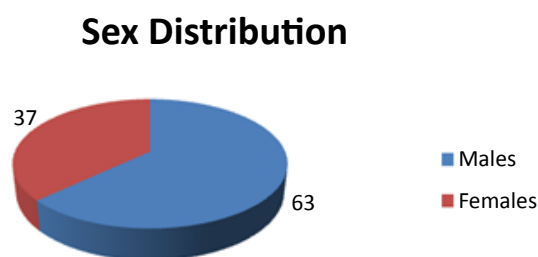


Figure 1 Sex distribution of study cases

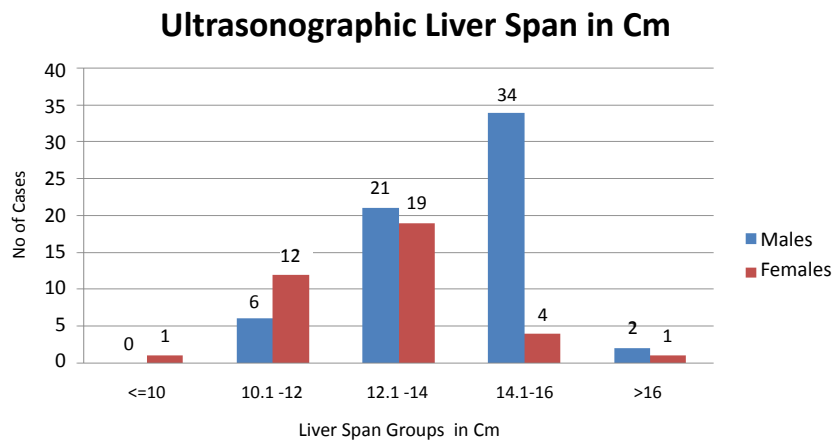


Figure 2 Measurements of liver span by clinical method

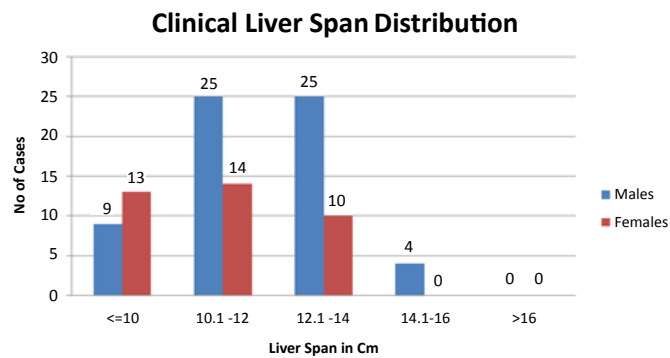


Figure 3 Measurements of liver span by ultrasound

The mean liver span measured ultra-sonographically in mid-clavicular line was 13.65 cm ± 1.5 cm. Males had mean liver span of 14.16 cm ± 1.32 cm while in females it was 12.79 cm ± 1.40 cm.

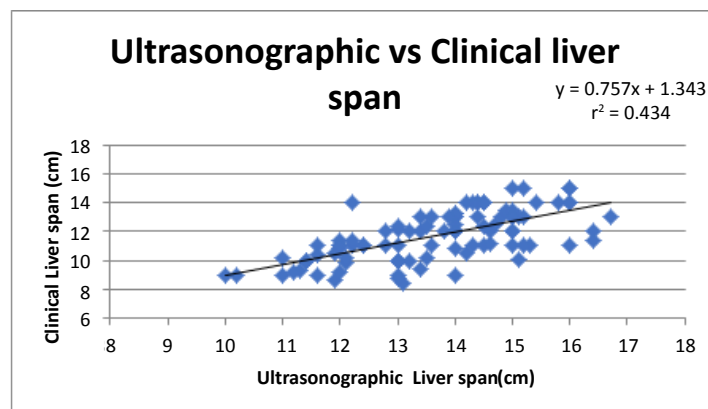


Figure 4 Comparison between clinical and ultra-sonographic methods

Table 1 Correlation between Ultrasonographic liver span and Clinical liver span

R value	p value	Significance
0.659	<0.001	Significant

### DISCUSSION AND CONCLUSIONS

The mean liver span measured in mid-clavicular line ultra-sonographically was higher in our study probably because the percentage of males was higher than previous studies.

In the present study, it has been shown that clinically determined liver span compared with liver span obtained by ultra-sonographically in mid clavicular line had significant difference. The mean liver span measured by clinical method was  $11.64 \text{ cm} \pm 1.7 \text{ cm}$  while ultra-sonographic liver span was  $13.6 \text{ cm} \pm 1.49 \text{ cm}$ .

Clinical method of estimating liver span severely underestimates the true size of the liver as determined by ultrasound or scintiscanning by Sullivan, et al. [9]. This is because it is difficult to locate the dome of liver by percussion (clinicians generally place it 2 cm to 5 cm too low) and because it is possible to obtain a resonant percussion note over a very thin lower edge of the liver which is placed more than 2 cm too high in nearly 50% of all subjects. It is also suggested that the normal span is unique to the examiner and non-generalizable [10].

Liver span was shown to be higher in the male subjects as compared to the females. The mean clinical liver span measured in mid-clavicular line in males was  $11.99 \text{ cm} \pm 1.6 \text{ cm}$  and in females it was  $11.05 \text{ cm} \pm 1.5 \text{ cm}$ . Ultra-sonographic mean liver span in males was  $14.16 \text{ cm} \pm 1.32 \text{ cm}$  while in females it was  $12.79 \text{ cm} \pm 1.40 \text{ cm}$ .

Significant difference was found between clinical and ultra-sonographic liver span in the MCL in the subjects ( $p < 0.001$ ) [11].

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