Correlation of Liver and Spleen Size

Determinations by Nuclear Medicine Studies and Physical Examination

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The size of the liver and spleen was determined by scintiphraphy in 214 patients and the results correlated with the physical findings concerning these two organs. False-positive interpretations of liver size and false-negative interpretations of spleen size were very common as determined by physical examination. The findings of a palpable spleen by physical examination correlated to a very high degree with anatomical enlargement of that organ.

Accurate knowledge of the size of the liver and spleen is often important in the diagnosis of disease. As a consequence, the discovery of a palpable spleen or liver on physical examination frequently results in an involved and occasionally unnecessary work-up of the patient. Indeed, great efforts are expended in detecting enlargements of the liver and spleen at the time of physical examination by maneuvers such as palpation, percussion, patient positioning, and ballottement.1,2 Of paramount importance, therefore, is the question: How accurate are these maneuvers in evaluating the size of these organs when routinely performed by practicing physicians? Certainly, palpation alone is inadequate since either organ may be displaced inferiorly into the abdomen by the contents of the chest. Similarly, these organs cannot always bepercussed because of the obesity of the patient or hyperaeration of the lungs. In the present study, we attempted to estimate the size of the liver and spleen by hepatic and splenic scintigraphy and to correlate the data with the clinical findings of the physicians who examined the patient.

Materials and Methods

Scintigraphic examination of the liver and spleen was performed on 214 patients at the University Hospital of San Diego County. All studies were performed on an Anger-type scintillation camera utilizing a 4,000- or 15,000-hole "high-resolution" straight-bore collimator. Technetium Tc 99m sulfur colloid was prepared by a modification of the method of Patton et al and employed in all cases. Anterior, posterior, and cross-table lateral views were obtained of the liver and of the spleen. Costal margin markers were placed anteriorly along the right and left costal margins. Three hundred thousand counts were collected in the anterior view and the time was noted. All subsequent views of the liver and spleen were recorded for this same time interval. No attempt was made to alter the respiratory pattern during imaging. The size of the liver and spleen was determined both objectively and subjectively. Objective data were obtained by placing a metal marker of known dimensions over the spleen and liver. The right lobe of the liver was considered to be enlarged if it exceeded 16 cm in the superior inferior dimension in the midclavicular line on the anterior projection, in the manner of McAfee et al.1 It should be remembered that one of the measurements of McAfee et al used to determine the upper limits for liver size was the maximum vertical dimension, as opposed to the midclavicular dimension used by our group. The latter dimension is almost invariably shorter than the maximum vertical measurement. Therefore it is less likely that the liver size will be overestimated. Autopsy data correlated positively with our measurements in all cases. Further verification of the accuracy of determining liver size by nuclear medicine technique was shown by Naftalis and Leevey.1 These investigators obtained good correlation between the midclavicular dimension of the liver and liver size in patients on whom autopsy was eventually performed. The findings of these investigators obviously do not take into consideration enlargement of the left lobe of the liver, in this investigation, subjective observation alone was used to determine its size. While these subjective data cannot be accepted as "proof," the fact remains that our subjective observations regarding the left lobe of the liver have frequently been proved right at autopsy. In fact, in only a small percentage of our patients was the left lobe of the liver enlarged. This was classified as small after subjective interpretation of the data by more than one member of the staff. The spleen was considered enlarged if it exceeded a measurement of 12 cm in length by 7 cm in width in any projection. These dimensions are comparable with the findings of Larson et al. These findings also correlated well with our autopsy findings. The nuclear medicine evaluation of liver and spleen size was made without knowledge of the clinical findings at the time of the study. After collection of all nuclear medicine data, the clinical charts were reviewed and the final clinical impression of liver-spleen size as determined on physical examination was recorded, as well as the final primary diagnosis and secondary disease state.

Results

Complete laboratory and clinical data were obtained in 214 patients. In 113 (53%) patients, the liver was considered to be either enlarged or reduced in size by physical examination, compared to 94 (44%) as determined by scintigraphy. In only 29 (14%) patients was the spleen considered to be enlarged by physical examination, but splenic enlargement was suggested in 92 (43%) patients by scintigraphy. In 145 (68%) patients, results of at least one liver function study were abnormal. In 141 (66%) patients, clinical determination of liver size concurred with

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the scintiphographic data; 74 (35%) had normal-sized livers and 67 (35%) had either small or enlarged livers. In 21% (46) of the patients, physical examination resulted in a false-positive finding. False-negative findings occurred 13% of the time (27 patients). Thus, of the 113 patients in whom there was clinical evidence of abnormal liver size, 46 (41%) were actually normal; in 27 of 101 patients (27%) in whom no clinical evidence of abnormal size existed the liver was actually normal.

There were 92 cases of splenomegaly determined by scintigraphy. In 148 (69%) patients, clinical methods correctly determined the spleen size; 122 (58%) were normal 26 (12%) enlarged. A discrepancy existed in the remaining 69 (32.4%). The greatest number of these patients (66 or 31%) had false-negative results. Of more interest is the fact that of the 92 cases of splenomegaly, only 26 (28%) were detected by physical examination. False-positive results occurred infrequently, in three (1.4%) patients.

Comment

The data presented tend to confirm what has long been suspected by specialists in internal medicine. The correct determination of the size of the liver and spleen by physical examination is difficult and sometimes impossible. The discovery of false-positive determinations of liver size and false-negative measurements of spleen size by physical examination was expected by the authors; the frequency of these findings, however, was surprising. In a review of the clinical charts, 1 to 12 members of the medical profession (ranging from medical students to department chairmen) examined these patients and almost invariably concurred with one another’s findings. In the majority of cases, a minimum of three complete physical examinations were recorded on the charts, eg, by a medical student, an intern, and a resident. In 13 patients, ascites was present, which made the physical examination of the liver and spleen much more difficult. In such cases, the clinician could often do little more than speculate about the correct size of the liver and spleen. A more frequent cause of false-positive liver size measurements, especially in older patients, was some form of chronic obstructive lung disease, which made percussion of the upper border of the liver very difficult. Obesity of the patient obviously could cause severe problems in palpation and percussion of the abdomen, and would appear to have contributed to errors in determining liver and spleen size. Other pathological processes, such as severe scoliosis or lordosis, may have caused anatomical position changes that created the impression of an enlarged or small organ.

It was obvious from reviewing the charts that just the appearance of an organ below the costal margin frequently resulted in that organ being considered enlarged. This was undoubtedly a major factor in the number of false-positive results of liver examinations encountered in our study. In the majority of patients, the scintiphographs revealed that the liver edge protruded to at least some degree below the right costal margin, regardless of size. In every case in which the spleen was palpated, it was considered clinically to be enlarged.

Importantly, this resulted in only three cases of false-negative determinations. The consistency of the spleen apparently played some part in determining whether or not it was considered to be enlarged by physical examination. In several patients, the spleen was noted to fill nearly the entire left side of the abdomen, yet it was not described as enlarged by any of the clinicians who examined the patient. In a Dartmouth College study of the incoming freshmen college students, the spleen was noted to be palpable by physical examination in approximately 3.9% of the students. It was apparent that the authors of that study considered the organ to be enlarged in such students—an assumption that was probably true, based on our findings. Unfortunately, this study also implied that if the spleen could not be observed to be enlarged by physical examination, it was not enlarged. Our studies would suggest that such conclusions are unwarranted, and that future investigations of the natural history of persons with enlarged livers and spleens will have to be verified by techniques that are less vulnerable to subjective interpretation. Although it is not completely devoid of a certain degree of subjective interpretation (ie, determining the size of a three-dimensional organ by measuring any two dimensions), the liver and spleen scintiphogram may be counted on to offer a relatively clear-cut assessment of the size of these organs, except in the truly borderline cases.

Nonproprietary Name and Trademarks of Drug

Technetium Tc 99m sulfur colloid—Colloscan-99m, Tesunoid Kit.

References