The impact of high-resolution ultrasound in the differential diagnosis of non-hemolytic jaundice

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Summary
Because jaundice is a common reason for hospital admission. A fast and correct differential diagnosis is very important to increase treatment efficacy. The aim of our study was to evaluate the impact of the high-resolution ultrasound in this kind of clinical setting. In a prospective study we included 30 patients and we divided them in patients with extrahepatic jaundice and patients with intrahepatic jaundice. We observed a high accuracy of the high-resolution sonography, with a sensitivity of 95% and a specificity of 100% for extrahepatic jaundice, and a sensitivity of 100% and a specificity of 95% for intrahepatic jaundice. We conclude that the high-resolution ultrasound should be used in the very beginning of the diagnostic algorithm for the evaluation of patients with unclear jaundice.

Key words. Ultrasound, jaundice.

Impacto del ultrasonido de alta resolución en el diagnóstico de la ictericia no hemolítica

Resumen
La ictericia es una causa común de admisión al hospital. El conocimiento del diagnóstico diferencial y los métodos para llegar a un diagnóstico rápido y preciso son esenciales para el manejo efectivo de estos pacientes.

El objetivo de nuestro estudio fue evaluar la utilidad del ultrasonido de alta resolución en el manejo de esta condición clínica. En un estudio prospectivo incluimos 30 pacientes con ictericia, la cual se dividió en ictericia extra e intrahepática. El uso del ultrasonido de alta resolución permitió una alta precisión diagnóstica en los casos de ictericia extrahepática, con una sensibilidad de 95% y una especificidad de 100%. Para la ictericia intrahepática la sensibilidad fue de 100% y la especificidad de 95%. Concluimos que este nuevo método de sonografía de alta resolución tiene una adecuada precisión diagnóstica, por lo que proponemos que forme parte del algoritmo diagnóstico inicial en el manejo del pacientes con ictericia.

Palabras claves. Ultrasonido, ictericia.

Jaundice is a common reason for the attendance of patients to an emergency room. There are many causes of jaundice and many different pathways of diagnosis and treatment. Therefore, it seems very important to elucidate the etiology of the jaundice quickly and reliably in order to ensure an adequate treatment.

Abdominal ultrasound is a widely used diagnostic tool for the differentiation of the biliary system diseases. Advantages of ultrasound include the wide availability, the lack of damaging radiation, the possibility of a bedside examination and the low costs.1,2 On the other hand, potential disadvantages include the reliance on the skill of the examiner, the limited viewing of retroperitoneal structures3 and the problems of documentation.

Within the last ten years there was a rapid deve-
development of new ultrasound techniques that led to several improvements, especially in the digital imaging capabilities. All this new technical support can be embraced by the term high-resolution ultrasound. High-resolution ultrasound includes the techniques of compound-scan and harmonic imaging. In all high-end ultrasound equipments one or both modes are available today. Although there was a great development in techniques, few data about its impact in the routine clinical setting are available. Most of data evaluating ultrasound for the diagnosis of biliary diseases stems from experiences with outdated ultrasound equipments.7

The aim of this study was to evaluate the impact of modern high-resolution ultrasound in the differential diagnosis of unclear non-hemolytic jaundice.

Patients and methods

In a prospective study, 48 consecutive patients with jaundice underwent an abdominal ultrasound examination immediately after their admission. Nineteen women and 29 men, with an average age of 60.8 years (range 18 to 86 years) could be prospectively included in this study. The same experienced examiner performed all examinations (SR). We defined experienced examiner as having performed at least 20,000 examinations. The examiner had to divide all patients in two groups according to ultrasound results: patients with intrahepatic jaundice and patients with extrahepatic jaundice. Extrahepatic jaundice was defined as the presence of dilated intrahepatic ducts (higher than 3 mm) and/or dilated main bile duct (higher than 8 mm or higher than 10 mm after cholecystectomy). When the examiner considered that the jaundice had an extrahepatic origin he was asked to specify the etiology of the bile duct obstruction.

For all examinations we used a Philips iU 22 ultrasound system with a 2-5 MHz convex-scanner. All new technical supports, like compound-scan or harmonic imaging, could be used and optimized by the best image quality. The examinations in B-mode were all carried out with one focus and a mechanical index of 1.6. The examiner was blinded for all other diagnostic results.

The evaluation of all data was accomplished after discharging the patient, when the final diagnosis was available based on all imaging examinations (CT-scan, endoscopic retrograde cholangiography and magnetic resonance imaging), laboratory tests and clinical follow-up.

Results

Eighteen of the 48 patients had to be excluded from the study because of a known hepatic disease or a missed follow-up. The remaining 30 patients were classified as patients having extrahepatic jaundice in 19 (64%) cases and intrahepatic jaundice in 11 (36%). Jaundice was misclassified as intrahepatic (acute hepatitis) in 1 (9%) of these 11 patients. In this case the final diagnosis, made by endoscopic retrograde cholangiography, was a passing common bile duct stone. All the other sonographic diagnoses were correct: 4 patients with acute hepatitis, 4 with liver cirrhosis and 2 with liver metastases without dilation of the bile ducts. Patients with the sonographic diagnosis of extrahepatic jaundice had carcinoma of the pancreatic head in 6 cases, cholangiocellular carcinoma in 6, choledocholithiasis in 5 and benign bile duct stenosis in 2. These data led to the validation of sonography as a diagnostic method (Table 1).

The cause of the extrahepatic jaundice was found in 18 of 20 cases (90%). Besides the wrongly classified case, a choledocholithiasis was misdiagnosed as a cholangiocarcinoma. The cause of intrahepatic jaundice could not be so clearly named but other structures, like enlarged lymph nodes, gave an indirect hint for the diagnosis. The Figures 1, 2 and 3 show typical findings in the differential diagnosis of jaundice.

Table 1. Results of high-resolution ultrasound for the differentiation of extrahepatic and intrahepatic jaundice.

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<thead>
<tr>
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<th>Extrahepatic jaundice (n = 19)</th>
<th>Intrahepatic jaundice (n = 11)</th>
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<tbody>
<tr>
<td>Sensitivity (%)</td>
<td>95</td>
<td>100</td>
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<tr>
<td>Specificity (%)</td>
<td>100</td>
<td>95</td>
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<tr>
<td>Positive predictive value (%)</td>
<td>100</td>
<td>91</td>
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<tr>
<td>Negative predictive value (%)</td>
<td>91</td>
<td>100</td>
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Discussion

Compound scan ultrasound defines a technique that joins data of a single point from up to nine dif-
Different angles compounding with them a two-dimensional picture. This leads to a higher quality in delineation, a better differentiation of borders and a better visualization of luminal structures in a real time scan. Harmonic imaging stands for a technique that uses only the double frequency of that sent by the probe to produce the scan. These harmonic waves are spontaneously built in the deeper layer of the scanned structure. So artifacts that originate from the superficial layers, such as fat, can be especially avoided.

Using these techniques, our data suggest that an experienced examiner is able to classify an unclear jaundice with a high reliability. In most cases we were able to find the cause of the extrahepatic jaundice. The current literature on the utility of transabdominal ultrasound for the differentiation between intra- and extrahepatic diseases shows poor yields. Furthermore, the diagnostic accuracy of ultrasound for the detection of common bile ducts stones is reported as being low. We believe that one of the critical points for the differences between the results of former studies and our data is the rapid and improved technical development of ultrasound in the last years, leading to an enhancement not only of the sensitivity but also of the specificity and accuracy. Thus, our findings are important because we demonstrate that currently available technology in ultrasound may yield excellent results when diseases of the biliary tree are evaluated. Our results prompt the performance of larger studies to confirm them. We conclude that abdominal ultrasound using new modalities like compound scan and harmonic imaging results in a high yield of diagnosis for patients with jaundice. Thus it could play an important role in the algorithm for the management of patients with hepatobiliary disorders.

References


