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Detailed EFSUM recommendations on the scope of ultrasound assessment in patients with portal hypertension considering the diagnostic reference level

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Abstract

An important paper describing the Standards of the Polish Ultrasound Society regarding the assessment of portal and hepatic vasculature was published in the Journal of Ultrasonography. Due to the multiplicity of morphological and hemodynamic data required, the time needed to obtain these data and the legal responsibility of doctors for the results, there seems to be a need to determine a clear range of the assessed parameters depending on the reference level of a given healthcare facility. Therefore, the aim of this paper was to transfer the recommendations of the European Federation of Societies for Ultrasound in Medicine and Biology, which determine the range of the evaluated ultrasonographic parameters in portal hypertension depending on the diagnostic reference level, into Polish reality. European healthcare institutions are characterized by a clear three-level reference network. Due to the lack of a similar division in Poland, we propose our own classification of the competence of medical entities. The first reference level: ultrasound assessments in a primary health care setting (performed by GPs, emergency physicians, non-specialist private practice physicians, non-specialist practice physicians); at least one mid-class ultrasound scanner with pulsed and color Doppler options, equipped with convex 3–5 MHz and linear 7–12 MHz transducers should be available at physician's disposal. The second reference level: ultrasound assessments in the hospital setting and specialist outpatient clinics, performed by specialist private practice physicians, radiologists, gastroenterologists and hepatologists; top class (premium) digital ultrasound scanner should be available at physician's disposal. Third reference level: ultrasound assessments performed in gastroenterology, hepatology and liver surgery departments as well as their specialist outpatient clinics; physicians should use top class digital ultrasound equipment. At every reference level, physicians performing abdominal ultrasound should have the appropriate certification to perform such an assessment or specialize in gastrointestinal diagnosis.

A paper entitled "*Standards of the Polish Ultrasound Society. Ultrasound examination of the portal system and hepatic vessels*" by Lechowicz and Elwertowski was published in the Journal of Ultrasonography[1]. This important article discussed in detail the unique anatomy of the portal system and other visceral vessels under both normal and pathological conditions. Technical aspects and methodology of ultrasound assessment in relation to clinical data were presented. The need to consider morphological and hemodynamic parameters obtained using pulsed and color Doppler, taking into account the standards used in the assessment of portal hypertension, in the assessment using convex and linear transducer, was also mentioned. The last part of the paper included a comprehensive description of the procedure. Due to the multiplicity of morphological and hemodynamic data that need to be determined in accordance with the Standards, the time needed to obtain these data and the legal responsibility of doctors for the results, there seems to be a need to determine a clear range of the assessed parameters depending on the reference

level of a given healthcare center. It may be assumed that this was motivated by the EFSUMB (European Federation of Societies for Ultrasound in Medicine and Biology) recommendations[2]. Therefore, the aim of the paper was to present the EFSUMB recommendations on the range of the evaluated ultrasonographic parameters in portal hypertension depending on the reference level. European healthcare centers are characterized by a clear three-level reference system.

Due to the lack of a similar division in Poland, we propose our own classification of the competence of medical entities.

Due to its multiple advantages, ultrasonography is available both in outpatient and highly specialized healthcare settings. Therefore, the reference system for the assessed ultrasound parameters in portal hypertension could be as follows:

- 1st reference level: ultrasound assessments in a primary health care setting (performed by GPs, emergency physicians, non-specialist private practice physicians, non-specialist practice physicians); at least one middle class ultrasound scanner with pulsed and color Doppler options, equipped with convex 3–5 MHz and linear 7–12 MHz transducers should be available at physician's disposal;
- 2nd reference level: ultrasound assessments in the hospital setting and specialist clinics, performed by specialist private practice physicians, radiologists, gastroenterologists and hepatologists; top class (premium) digital ultrasound scanner with all Doppler options and appropriate transducers, i.e. convex and linear transducers, should be available at physician's disposal.
- 3rd reference level: ultrasound assessments performed in gastroenterology, hepatology and liver surgery departments as well as their specialist outpatient clinics; top class (premium) digital ultrasound equipment with all Doppler options and appropriate transducers, i.e. convex and linear transducers, should be available at physician's disposal.

It should be emphasized that at every reference level, physicians performing abdominal ultrasound should have the appropriate certification to perform such an assessment or specialize in gastrointestinal diagnosis.

According to Berzigotti and Piscaglia, the authors of the EFSUMB recommendations, the range of assessed parameters should be as follows[2]:

The 1st reference level requires:

- a search for the signs of cirrhosis [an assessment of liver configuration (lobe size) and surface area as well as its echostructure];
- a search for focal lesions;
- an assessment of the diameter and patency of the hepatic veins;
- an assessment of the diameter, patency and flow direction in the portal vein and its lobar branches;
- a search for portal-systemic collateral pathways;
- a determination of the size of the spleen (size, surface area);
- a search for ascites

The authors of the recommendations[2] commented on these guidelines:

1. Reversed portal flow, portal vein thrombosis and the presence of portal-systemic collateral pathways are pathognomonic manifestations of clinically significant portal hypertension, irrespective of cirrhosis.
2. Splenomegaly, ascites and portal vein dilation suggest clinically significant portal hypertension, but only in patients with cirrhosis. In the case of identified portal or hepatic vein obstruction, other causes of this pathology should be sought.
3. Hepatic vein obstruction in the absence of hepatic nodular lesions is a pathognomonic manifestation of Budd–Chiari syndrome (whose etiology requires a separate explanation).

The 2nd reference level requires:

- an assessment of all morphological and hemodynamic parameters from reference level 1, and:
- a determination of the course, diameter and Doppler spectrum in the hepatic veins;
- a determination of the patency and flow direction in the segmental branches of the portal vein, splenic vein and the superior mesenteric vein;
- an assessment of the extent of portal vein thrombosis;
- a determination of portal vein flow velocity (the mean maximum velocity – about 20 cm/s);
- an assessment of the diameter variability in response to splenic and superior mesenteric vein respiratory cycle.

The comment of the authors of the recommendations[2] on the second reference level includes all data specified in the comment on the first reference level, as well as:

1. Flattened Doppler spectrum in the hepatic veins may occur in chronic liver diseases, irrespective of their severity. Identification of this phenomenon in cirrhosis is associated with poor prognosis.
2. Dilated hepatic veins (and the inferior vena cava) suggest an extrahepatic cause of portal hypertension (e.g. the so-called cardiac cirrhosis caused by right-sided heart failure).
3. Reversed blood flow in the main trunk of the portal vein and the right branch of the portal vein or the splenic vein or the superior mesenteric vein is suggestive of clinically significant portal hypertension. Local intrahepatic blood flow reversal may indicate the presence of arterioportal fistula.
4. Portal vein thrombosis (in the portal vein trunk, the splenic vein or the superior mesenteric vein as well as the lobar branches of the portal vein, even when located paramurally, is a pathognomonic manifestation of portal hypertension.
5. Reduced portal blood flow velocity in compensated chronic liver disease should contribute to the diagnosis of cirrhosis; significantly reduced portal flow velocity indicates clinically significant portal hypertension and is a negative prognostic factor in compensated cirrhosis.
6. The presence of stiff splenic or superior mesenteric veins (lack of variation of the venous diameter during respiration) indicates with a high probability portal hypertension.

The 3rd reference level requires:
- an assessment of all morphological and hemodynamic parameters performed at reference stage 1 and 2, as well as:
- an assessment of splenic and renal arteries;
- a characterization of portal vein thrombosis by determining the degree of vascular occlusion as well as an assessment of portal biliopathy (compression exerted by the dilated venous plexuses on extrahepatic bile ducts leading to cholestasis),
- an overall, detailed assessment of hepatic circulation.

The comment of the authors of the recommendations[2] on the third reference level includes all data specified in the comment on the first and the second reference levels, as well as:

1. An increased splenic artery resistance index in patients with cirrhosis indicates with high probability clinically significant portal hypertension.
2. An increased renal artery resistance index is an independent predictor of renal dysfunction.
3. Differentiation between thrombosis and a tumor mass ingrowing into the lumen of the portal vein should be preferably performed using contrast-enhanced ultrasound (CEUS).
4. An overall assessment of the vascular bed, including a detailed evaluation of hemodynamic parameters (blood flow velocity and direction, the presence of collateral pathways), should be performed in patients with Budd–Chiari syndrome and those with veno-occlusive disease.

Lastly, it should be added that the time limit for each reference level 2 overall abdominal ultrasound scan should by extended by at least 5 minutes, and thus it should last between 20 and 25 minutes. The time limit should be at least 25–30 minutes for reference level 3.

The data included in the *Standards* and *Recommendations* require physicians dealing with abdominal ultrasound diagnosis to have adequate skills, which may be acquired by participating in training courses organized by recognized ultrasound schools.

Conflict of interest

The authors do not report any financial or personal connections with other persons or organizations, which might negatively affect the content of this publication and/or claim authorship rights to this publication.

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