

# Journal of Hepatology

## Definition of SPSS: Computer-assisted image processing for better quantification.

--Manuscript Draft--

<b>Manuscript Number:</b>	
<b>Article Type:</b>	Letter to the Editor
<b>Section/Category:</b>	Cirrhosis and Liver Failure
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1 **Definition of SPSS: Computer-assisted image processing for better**  
2 **quantification.**

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19 **Key words:** spontaneous portosystemic shunt, portosystemic shunt, SPSS,  
20 computed tomography, cirrhosis, liver, acute decompensation, portal hypertension,  
21 hepatic encephalopathy, acute-on-chronic liver failure, ACLF,

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36  
37  
38 **Electronic word count: 411**

39  
40  
41 **Number of figures and tables: 1 Table, 1 Supplementary video**

42  
43  
44 **Conflict of interest statement: No conflict of interest.**

45  
46  
47 **Financial support:**

48 Jonel Trebicka is supported by grants from the Deutsche Forschungsgemeinschaft  
49 (SFB TRR57), Cellex Foundation and European Union's Horizon 2020 research and  
50 innovation program (No 668031). Joan Genescà is a recipient of a Research  
51 Intensification grant from Instituto de Salud Carlos III, Spain. The study was partially  
52 funded by grants PI15/00066, and PI18/00947 from Instituto de Salud Carlos III and  
53 co-funded by European Union (ERDF/ESF, "Investing in your future"). Centro de  
54 Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas  
55 supported by Instituto de Salud Carlos III. Macarena Simón-Talero is a recipient of  
56 the grant JR 17/00029 from Instituto de Salud Carlos III.

57 The funders had no influence on study design, data collection and analysis, decision  
58 to publish or preparation of the manuscript.

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61 Dear Editors,

62 We appreciate the interest of Nicoară-Farcău et al. in our recent multicenter study  
63 published in *Journal of Hepatology* (1) and we share their effort to highlight the  
64 impact of total cross-sectional SPSS (spontaneous portosystemic shunt) area (TSA)  
65 on the outcome of patients with liver cirrhosis.

66 In their letter to the editors, the authors bring up issues, all of which are related to a  
67 lack of a generally consented definition of SPSS. In fact, the lack of data on SPSS  
68 was the reason for the members of the international Baveno cooperation to form the  
69 Baveno VI-SPSS group and to conduct the largest studies on this topic so far (1,2).

70 In response to Nicoară-Farcău and colleagues, we agree that gastroduodenal shunts  
71 seem important, since they are found in many patients with gastric varices and  
72 therefore possibly associate with bleeding. In total, 990 SPSS in patients with  
73 available follow up data were found. The distribution of the types of SPSS is shown in  
74 table 1. Moreover, we calculated the fraction of patients developing variceal bleeding  
75 according to the presence of a certain SPSS type. The rate of variceal bleeding in  
76 patients with gastroduodenal shunt was 12.2%, not significantly different from other types  
77 of SPSS (table1).

78 A possible reason for this finding is the current lack of radiologic predictors of  
79 progression of SPSS due to the cross-sectional design of our study(3). However,  
80 splanchnic and systemic hemodynamics in cirrhotic patients can change and  
81 longitudinal studies on the dynamic of SPSS are needed.

82 Another reason lies in the challenges in quantifying SPSS. Currently, those  
83 measurements need to be performed manually by a trained professional. This is  
84 especially challenging for (para-) esophageal varices, which tend to build collateral

85 networks, which are almost impossible to quantify by hand. Hence, these were not  
 86 quantified in our recent studies. However, automated, computer-assisted  
 87 quantification of SPSS could be a solution. Currently, we have developed a computer  
 88 application based on image processing. This application, based on MATLAB,  
 89 measures the diameter of each shunt and calculates automatically the cross-  
 90 sectional area of the SPSS, through image processing, independently whether it is  
 91 CT or MRI (see Supplementary Video). This application may facilitate the calculation  
 92 of TSA and may save significant time for health care professionals.

93 In conclusion, we acknowledge that we need a unified definition of SPSS. Using  
 94 modern computer-assisted techniques might help us overcome the mostly technical  
 95 obstacles in quantifying all SPSS, leading us to refer to the same definition in the  
 96 future.

97 **Table 1.**

Type of SPSS	Total	No Bleeding	Bleeding	Percentage
Splenorenal	384	328	56	14.6
Mesocaval	67	58	9	13.4
Mesorenal	9	8	1	11.1
Inferior Mesenteric-Caval	22	19	3	13.6
Gastrorenal	49	43	6	12.2
Umbilical	420	347	73	17.4
Others	39	35	4	10.3

98  
 99 **Legend to Supplementary Video:**

100 First, we select the image (CT/MRI). Once the image is uploaded, we press the  
 101 detection button in order to select the area of the SPSS. Automatically, the area will  
 102 appear below the image. If we need to select more SPSS, we can repeat the  
 103 process. Finally, the total SPSS area is shown.

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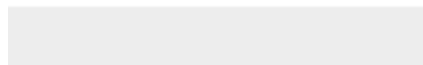
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