

Vascular invasion (Core)

Hepatocellular carcinoma

Vascular invasion (VI) is an independent prognostic factor in HCC after resection¹⁻⁸ as well as after transplantation.⁹⁻¹⁴ VI affects survival also in early HCC.¹⁵ For the 8th edition TNM staging system,^{16,17} VI is a component of the pT stage for tumours >2 cm diameter.¹⁶ However, tumours <2 cm diameter are staged as pT1a whether or not VI is present.

Vascular invasion (VI) is classified as MiVI. Macroscopic VI is defined as invasion of tumour into a major vessel that can be identified during macroscopic examination or radiological imaging and is part of established clinical algorithms, such as the BCLC and contributes to TNM assessment.

In the 8th edition of TNM,^{16,17} involvement of a major branch of portal vein or hepatic vein is classified as (p)T4. This refers to the main right or left branch of the vein, as distinct from macroscopic VI which relates to macroscopically visible involvement of any vessel – the width of the vessel is not helpful as intravascular tumour may distend the calibre of the vein.

Microscopic vascular invasion (MiVI) is usually defined as tumour within a vascular space lined by endothelium, visible only by microscopy, identified in the liver tissue surrounding the tumour and venous vessels in the tumour capsule and/or non-capsular fibrous septa. However, there is a lack of consensus for the definition of MiVI.¹⁸ Inter-observer and intra-observer variability in the evaluation of MiVI in HCC has been reported.¹⁹

Microscopic vascular invasion (MiVI) can be assessed in H&E stained sections, following strict criteria to avoid misinterpretation (i.e., presence of tumour cells in a space lined by endothelial cells, attachment of tumour cells to the vascular wall, or identification of muscular wall or elastic lamina of larger blood vessels). In challenging cases, the use of an IHC staining specific for smooth muscle or special stains for elastic fibres (e.g., Victoria blue, Orcein, E-VG) may be helpful to confirm the vascular nature of the affected structure.¹⁸ Tumour structures suspicious for VI, but for which the criteria above are not met, can be recorded as 'indeterminate'; this would not be regarded as MiVI for staging purposes.

There are several studies that sub-classify MiVI according to distance of vessels from the HCC, number of vascular structures involved and/or number of cancer cells identified within the vessel, which were able to demonstrate prognostic significance for survival.^{20,21,22,23} Recently, microscopic portal vein invasion was reported to be associated with poorer survival compared to microvessel invasion only, which was defined as newly developed microvascular structure in the tumour capsule or compressed and fibrotic peritumoral non-neoplastic liver.²⁴ However, these findings have not been validated by prospective studies and/or independent groups, and therefore subclassification of MiVI is not a required item at this stage.

Cholangiocarcinoma

Vascular invasion (VI) is an important prognostic factor for intrahepatic cholangiocarcinoma.²⁵⁻²⁹ Macroscopic VI is a strong predictor of survival: 5-year survival has been reported to be 0% for patients with macroscopic VI.^{25,26}

In the TNM classification staging system,^{16,17} VI is a component of the pT stage; intrahepatic VI is important for stage pT2 in intrahepatic cholangiocarcinoma while involvement of main portal veins and hepatic arteries are staging criteria for pT3 and pT4 in perihilar CC.

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