Lymphovascular invasion (Core and Non-core)

Since it is very difficult to differentiate vascular invasion from lymphatic invasion, the term lymphovascular invasion (LVI) is used in the pathology report to indicate invasion of vascular structures that may be lymphatic and/or blood vessels. The majority of authors agree that LVI should involve capsular or extra-capsular vessels in encapsulated tumours (Figure 2). In infiltrative tumours partially encapsulated or totally lacking a capsule, LVI can be present within the tumour nodule. These images (Figure 2) depict intracapsular LVI with tumour thrombus attached to the vessel wall, covered by endothelium or associated with fibrin. Tumour thrombus covered by endothelial cells qualifies as LVI (Figure 2b). However, endothelialization is not a requirement if the tumour is attached to the vessel wall (Figure 2c) or admixed with a fibrin thrombus (Figure 2d). If the tumour is encapsulated, intra-tumoural or subcapsular vessels do not qualify for LVI and should not be interpreted as such (Figure 2a). One study has raised the caveat that tumour cells within vascular lumina unassociated with thrombus, and tumour cells underlying intact endothelium could represent "pseudoinvasion" given the fenestrated, endothelial network of endocrine organs.[1] When this more stringent criterion of LVI is applied, the incidence of LVI in differentiated thyroid carcinoma decreased drastically from 7-62%[2-6] to 3%,[1] while the risk of distant metastasis in association with the mere existence of LVI becomes 35%. This latter approach has not been validated by additional studies and may fail to identify a significant proportion of thyroid tumours with LVI, focal or extensive, that should be classified as carcinoma based on the presence of invasion, and that may benefit from appropriate risk stratification and/or additional therapies.

The consensus opinion is that the criteria used in Figure 2 to define LVI should be utilized. In regard to the extent of LVI, several papers have shown that the presence of 4-5 foci of LVI in encapsulated follicular/Hürthle cell carcinoma confers a much worse outcome than lower number of LVI foci.[7-9] The most recent American Thyroid Association (ATA) guidelines classify a patient in a high risk category, if having 4 foci or more of vascular invasion (VI), while focal vascular invasion (VI) (<4 foci) in an intrathyroidal follicular carcinoma will put the patient in low risk group.[10] More importantly, the National Comprehensive Cancer Network (NCCN) 2019 guidelines have defined minimal vascular invasion as a few foci (1-4) of VI, and does not mandate radioiodine (RAI) administration in an intrathyroidal, well defined, follicular or Hürthle cell carcinoma, with minimal VI.[11] Consequently, it is important to report the extent of LVI in encapsulated thyroid carcinoma by counting the foci of LVI. It is noteworthy that most papers that validated the importance of LVI cutoffs have counted individual vessel sections invaded by tumour separately, as different foci. In regard to papillary thyroid carcinoma (PTC), the presence of LVI was shown to impart poorer outcome.[5] Furthermore any focus of VI in PTC will put the patient in an intermediate risk category according to the most recent ATA guidelines.[10] It is therefore mandatory to report on the status of LVI in PTC (i.e., core item). There is no evidence that the number of LVI foci impact on prognosis in non-encapsulated PTC. Counting the LVI foci in non-encapsulated PTC is therefore not a core item. It is however a core item in those PTC who are completely encapsulated.

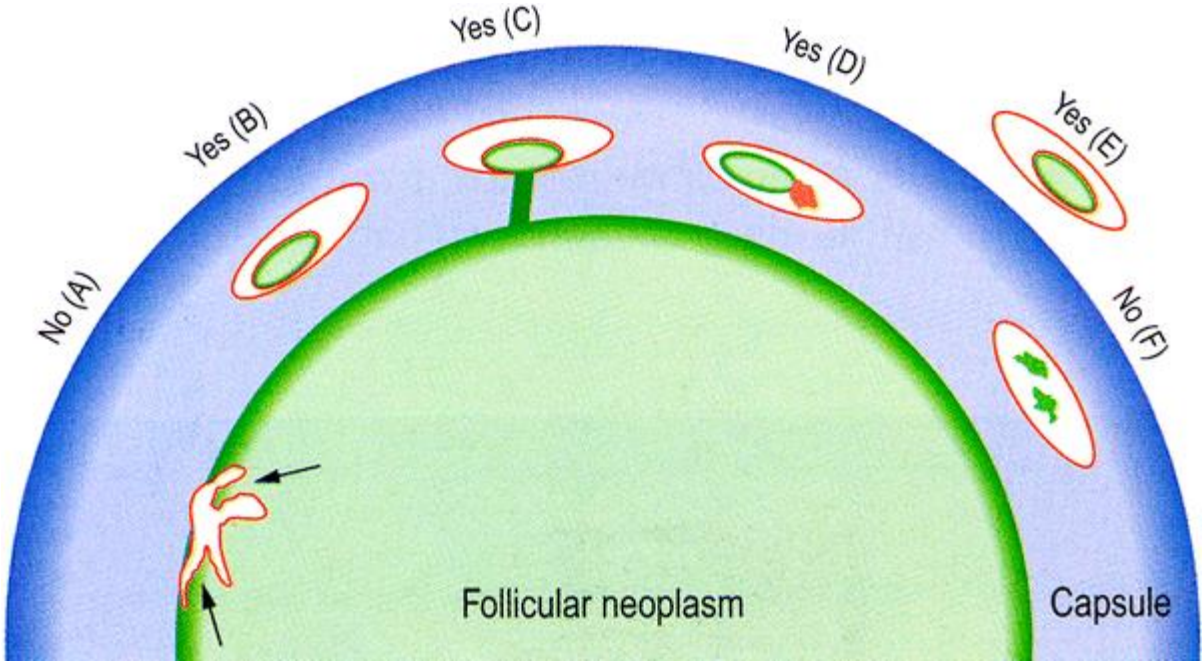

Figure 2: Lymphovascular invasion (LVI)

Schematic drawing for the interpretation of the presence or absence of LVI. The diagram depicts a follicular neoplasm (green) surrounded by a fibrous capsule (blue). **a** Bulging of tumour into vessels within the tumour proper does not constitute LVI. **b** Tumour thrombus covered by endothelial cells in intracapsular vessel qualifies as LVI. **c** Tumour thrombus in intracapsular vessel considered as LVI since it is attached to the vessel wall. **d** Although not endothelialized, this tumour thrombus qualifies for LVI because it is accompanied by a fibrin thrombus. **e** Endothelialized tumour thrombus in vessel outside the tumour capsule represents LVI **f** Artefactual dislodgement of tumour manifesting as irregular tumour fragments into vascular lumen unaccompanied by endothelial covering or fibrin thrombus. Reproduced with permission from Chan J (2007). *Tumours of the thyroid and parathyroid glands*. Diagnostic Histopathology of Tumours. Fletcher CDM. Churchill Livingstone Elsevier, Philadelphia.[12]

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