RECTAL CANCER: EXTRAMURAL VASCULAR INVASION (EMVI)

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• Tumor in the distal 15 cm of the intestinal tract
• Surgical resection with negative margins of at least 1 mm is the only locally curative therapy
• MRI is the most accurate method for local staging of rectal cancer
  • Useful to determine the necessary extent of surgical resection, and whether patients would benefit from neoadjuvant chemoradiation therapy
EXTRAMURAL VASCULAR INVASION (EMVI)

- EMVI is tumor extension into the vasculature beyond the muscularis propria
- It is indicative of locally advanced tumor, which extends deeper into the mesorectum, correlating with T3 or T4 disease
- Although EMVI is not included in the TNM staging system, the literature suggests that it is an important independent indicator of poor prognosis with:
  - Higher incidence of local recurrence
  - Higher incidence of distant metastases
  - Poorer response to neoadjuvant chemoradiation therapy
EXTRAMURAL VASCULAR INVASION (EMVI)

- EMVI has traditionally been detected on histopathology of surgical resections; however, it is thought to have been under-reported in the past.

- Compared to histopathologic analysis, MR has high specificity and moderate sensitivity for detection of EMVI.
  - MRI EMVI scores of 3 to 4 was 54% sensitive and 96% specific.
  - MRI EMVI scores of 2 to 4 was 79% sensitive but only 74% specific.
MRI DETECTION OF EMVI

- EMVI is seen on MRI as tubular or serpiginous perirectal vessels, which are irregular, expanded, or infiltrated with tumor signal intensity
  - May be directly contiguous or non-contiguous with the primary tumor
- Contrast enhancement increased reader confidence to diagnose EMVI compared to T2-weighted imaging alone
- EMVI correlates with depth of extramural invasion and proximity to mesorectal fascia
- Size of the involved vessels may also correlate with rate of metachronous metastasis and poor response to neoadjuvant chemoradiation therapy
## MRI Scoring of EMVI

<table>
<thead>
<tr>
<th>MRI EMVI score</th>
<th>Predicted EMVI Status</th>
<th>Imaging Features</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>Definitely not present</td>
<td>No nodularity or vessels adjacent to areas of tumor penetration</td>
</tr>
<tr>
<td>1</td>
<td>Probably not present</td>
<td>Minimal extramural stranding / nodular extension, but not in vicinity of any vascular structures</td>
</tr>
<tr>
<td>2</td>
<td>Equivocal</td>
<td>Stranding in vicinity of extramural vessels, which are normal size, and no definite tumor signal seen within</td>
</tr>
<tr>
<td>3</td>
<td>Probably present</td>
<td>Intermediate signal intensity within vessels, although only slightly expanded</td>
</tr>
<tr>
<td>4</td>
<td>Definitely present</td>
<td>Obvious irregular vessel contour or nodular expansion of vessel by definite tumor signal</td>
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</table>
Enlarged tubular vessel with intermediate tumor signal in the mesorectal fat adjacent to the tumor.
The same patient with irregular wispy enhancement of the enlarged left meso-rectal veins
T3 with +EMVI
A different patient with enlarged irregular vascular flow voids in the mesorectal fat.
TEACHING POINTS

• Although extramural vascular invasion (EMVI) is not included in the TNM staging system of rectal cancer, it is an important finding that should be included in the MR report for initial staging.

• EMVI is a significant finding which may help direct neoadjuvant chemoradiation therapy options and surgical planning.

• EMVI is an independent prognostic indicator for more precise risk stratification of locally recurrent and metastatic disease.

• MRI is superior to histopathologic analysis for detection of EMVI
REFERENCES


