Utility of a multivariate logistic regression model for the prediction of prostate cancer extracapsular extension based on 3TmpMRI, clinical, and biopsy

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Background:
- Extracapsular extension (ECE):
  - Poor prognostic factor
  - Associated with progression, recurrence and mortality
- Accurate staging:
  - Avoidance of positive margins
  - Planning nerve-sparing procedures
- Pre-operative MRI:
  - A guide for surgical planning

Objectives:
- To investigate the predictive value of clinical, biopsy & 3TmpMRI parameters using a multivariate logistic model for pre-lesion detection of PCA ECE with wholemount histopathology (WMHP) as reference.

Methods:
- IRB approved, HIPAA compliant observational study
- 575 patients with 774 true positive prostate cancer lesions
- July 2010 to February 2019.
- Clinical parameters:
  - Age
  - Prostate specific antigen (PSA)
  - PSA density (PSAD)
- Biopsy
  - % of positive systematic cores
  - Gleason score (GS)
- 3T mpMRI
  - Prostate volume
  - Number of lesions per patient
  - Size
  - Location
  - Lavel
  - PIRADSv2 score
  - Laterality
  - Apparent diffusion coefficient (ADC)

Results:

<table>
<thead>
<tr>
<th>Variable</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA (ng/ml), mean ± SD</td>
<td>8.4±9.2</td>
</tr>
<tr>
<td>Age (years), mean ± SD</td>
<td>61.6±5.9</td>
</tr>
<tr>
<td>Endorectal coil (lesions)</td>
<td>375/774 (48.5%)</td>
</tr>
<tr>
<td>PIRADS category</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>215/774 (27.8%)</td>
</tr>
<tr>
<td>4</td>
<td>332/774 (42.9%)</td>
</tr>
<tr>
<td>5</td>
<td>227/774 (29.3%)</td>
</tr>
<tr>
<td>MRI risk assessment for ECE</td>
<td></td>
</tr>
<tr>
<td>3+3</td>
<td>464/774 (59.9%)</td>
</tr>
<tr>
<td>3+4</td>
<td>191/774 (24.7%)</td>
</tr>
<tr>
<td>4+3</td>
<td>137/774 (17.7%)</td>
</tr>
<tr>
<td>ECE in final pathology</td>
<td>183/774 (23.6%)</td>
</tr>
</tbody>
</table>

**Bivariate Analysis**
- Higher PSA, PSAD, percentage of positive biopsy cores, biopsy GS, lesion size, PIRADSv2 score, bilaterality, ADC value, MRI risk assessment for ECE, location (posterior), level (midgland and base), and lower number of lesions per patient were significant for ECE prediction.

**Multivariate Analysis**
- Multivariate regression model for pathology extracapsular detection and the ROC for its performance

Conclusions:
- The multivariate regression model in this study based on clinical, biopsy and 3T mpMRI parameters have a high predictive value for pathology ECE detection

Acknowledgment:
The study was supported in part by the department of Radiology and Pathology Integrated Diagnostics (IDx) program and specialized program of research excellence (SPORE) of PCa.