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 per-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
 - Level
 - PIRADSv2 score
 - Laterality
 - Apparent diffusion coefficient (ADC)

- of capsule

 Moderate abuts risk: >1cm of capsule, broad bulging contact and capsule

• High

risk. capsular involving irregularity, fibromuscular anterior stroma and gross extraprostatic extension

Statistical analysis:

Results:

Variable	N (%)
PSA ^a (ng/ml), mean ± SD	8.4±9.2
Age (years), mean ± SD	61.6±6.9
Endorectal coil (lesions)	375/774 (48.5%)
PI-RADS category	
3	215/774 (27.8%)
4	332/774 (42.9%)
5	227/774 (29.3%)
MRI risk assessment for ECE	
3+3	464/774 (59.9%)
3+4	191/774 (24.7%)
4+3	137/774 (17.7%)
ECE in final pathology	183/774 (23.6%)

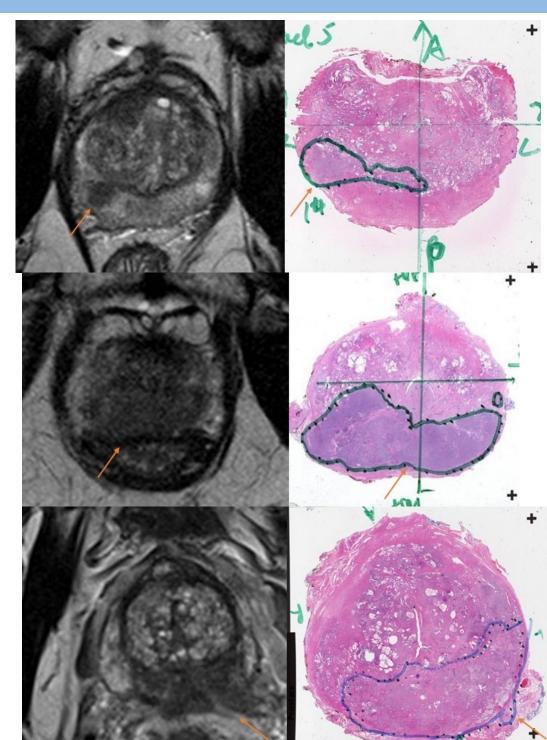
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Afshari Mirak S, Felker E, Sisk A., Reiter R., Raman SS. UCLA Prostate Imaging Research Group, Los Angeles, CA

• MRI risk assessment for ECE

 Low risk: doesn't abut capsule, may abut capsule and abuts ≤1cm

• Bivariate and multivariate analysis • ROC analysis for accuracy



Patient information

significant for ECE prediction.

Effect
Age (year)
PSA density (log)
Radiology size (cm)
Number of lesions
• 1
■ 2
• 3
Location
Anterior
Posterior
Anterior+posterior
Midgland
Base
PIRADSv2 score
= 3
= 4
= 5
MRI ECE Risk
■ Low
Intermediate
 High

Conclusions:

Acknowledgment :

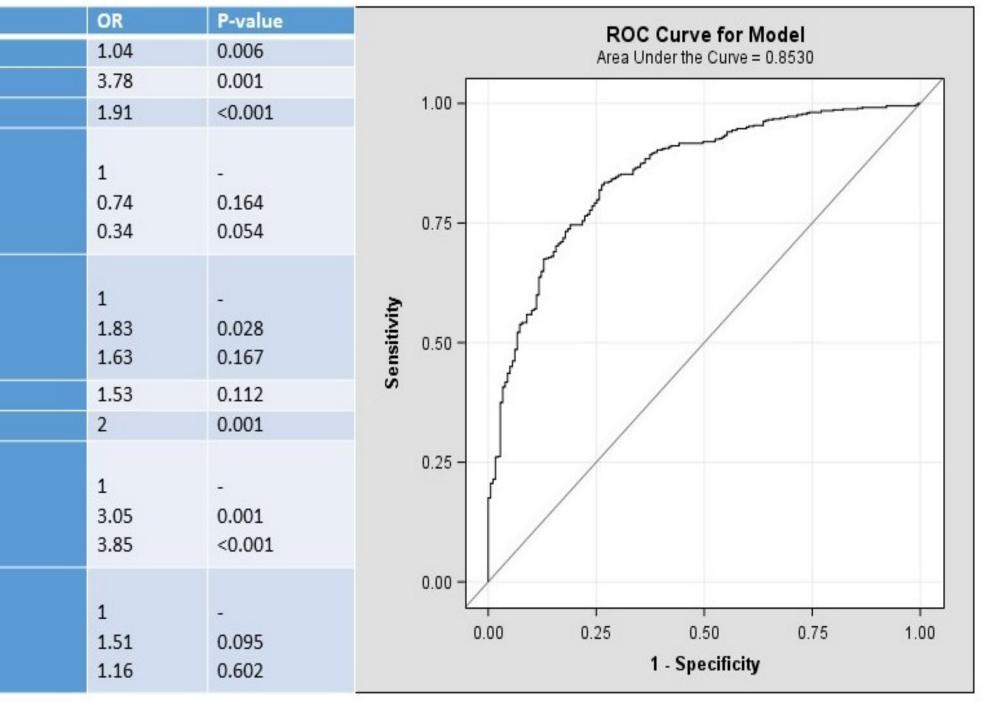
The study was supported in part by the department of Radiology and Pathology Integrated Diagnostics (IDx) program and specialized program of research excellence (SPORE) of PCa.

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

Multivariate Analysis

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



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



