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Can Multiparametric MRI Improve Our Ability to Predict Early Biochemical Recurrence after Radical Prostatectomy in Contemporary Patients Results from a Multi-Institutional Analysis

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INTRODUCTION

Available tools predicting biochemical recurrence (BCR) in prostate cancer (PCa) patients treated with radical prostatectomy (RP) still depict suboptimal characteristics. Moreover, they were developed in historical cohorts of men diagnosed with systematic biopsies and their generalizability to contemporary patients in the multi-parametric MRI (mp-MRI) era is still unknown.

MATERIALS AND METHODS

A total of 1,176 patients who received an mp-MRI and subsequent MRI-targeted biopsy underwent RP between 2015 and 2018 at six European referral centers were identified.

First, we assessed the discrimination of the EAU risk groups and the CAPRA score in predicting BCR. Second, we evaluated whether information obtained at mp-MRI (i.e., the presence of extracapsular extension [ECE] or seminal vesicle invasion [SVI] and the maximum diameter of the index lesion) were associated with the risk of BCR. Finally, we assessed whether the inclusion of these information in a Cox multivariable model improved the discrimination of available tools and we developed a risk calculator for BCR. We then compared the discrimination of these models by estimating the concordance index (C-index) and the observed versus predicted cumulative incidences at 36-month follow-up.

Decision curve analyses (DCAs) assessed the net benefit associated with the adoption of each model.

Patients characteristics

	n=1,176
Age at surgery	65 (60; 69)
PSA at diagnosis (ng/mL)	7.7 (5.4-11.2)
mpMRI IL max diameter (mm)	12 (9-16)
Extracapsular invasion at mpMRI	
ECE	175 (14.9)
SVI	56 (4.8)
Biopsy Grade Group	
1	155 (13.2)
2	556 (47.3)
3	268 (22.8)
4	123 (10.5)
5	67 (5.7)
Clinical T stage	
T1	773 (65.7)
T2	356 (30.3)
T3	35 (3)
Pathological T stage	
T2	502 (50.4)
T3a	415 (35.4)
T3b	164 (13.9)
T4	4 (0.3)
Pathological Grade Group	
1	53 (4.5)
2	561 (47.7)
3	390 (33.2)
4	62 (5.3)
5	107 (9.1)
Median follow-up (months)	27
3-year BCR-free survival	84.2%

Cox-regression analysis

	HR (95% CI)	P-value
ECE at mpMRI	1.9 (1.1-2.5)	0.02
SVI at mpMRI	2.04 (1.2-3.5)	0.001
mpMRI IL max diameter	1.06 (1.03-1.08)	0,001
PSA at diagnosis	1.02 (1.01-1.04)	0.001
Biopsy grade group		
1		
2-3	1.73 (0.79-3.79)	0.1
4-5	4.74 (2.12-10.5)	<0.001

Accuracy of risk scores

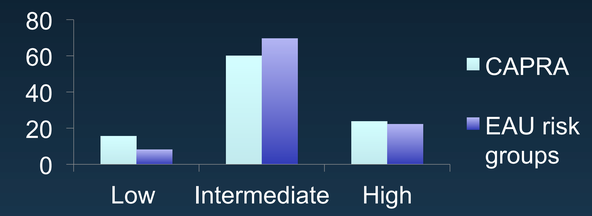
	AUC
CAPRA risk groups	65%
EAU risk groups	68%
Novel risk score	75%

RESULTS

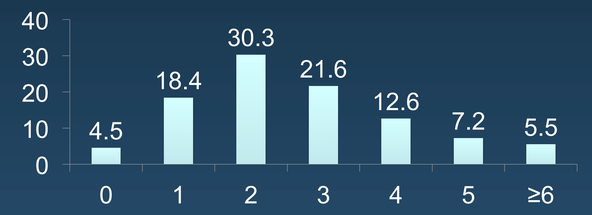
Novel Risk Score

Variable	Points
PSA	<10: 0 10-20: 1 >20: 2
Biopsy grade group	1: 0 2-3: 1 >3: 2
mpMRI stage	Organ confined: 0 ECE: 1 SVI: 2
Maximum diameter of the index lesion	<10: 0 10-15: 1 >15: 2

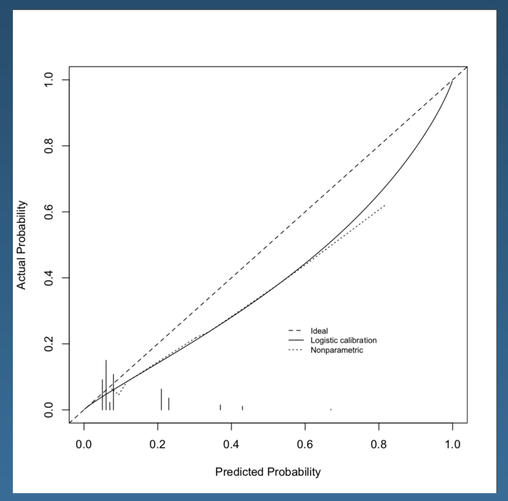
Available Tools



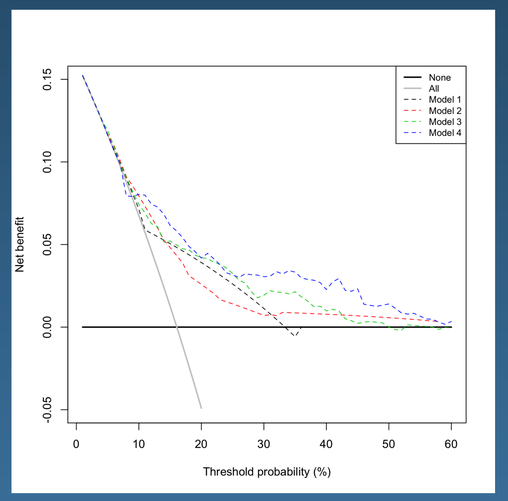
Novel Risk Score



Calibration plot



Decision-curve analysis



CONCLUSIONS

Available tools exhibit suboptimal characteristics in predicting BCR after RP in contemporary patients diagnosed with MRI-targeted biopsy. We developed and internally validated a novel accurate risk score that accounts for mp-MRI information in order to identify patients at higher risk of experiencing early recurrence after surgery.