Defining the role of preoperative multiparametric Magnetic Resonance Imaging (mpMRI) to predict extracapsular extension in radical prostatectomy specimen

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Introduction & Objectives: The risk prediction of extracapsular extension (ECE) is crucial for the adequate surgical planning in order to get best oncological and functional outcomes at radical prostatectomy (RP). Multiparametric MRI (mpMRI) of the prostate has become a fundamental tool for the diagnosis and staging in prostate cancer patients. The aim of this study is to identify the predictive factors of ECE in an institutional cohort of patients who underwent mpMRI prior to RP.

Materials & Methods: From 01/2013 to 02/2017, 126 patients underwent mpMRI before RP at Fundació Puigvert. Baseline characteristics of the patients, MRI data and pathology data were retrospectively gathered and analysed. Clinical parameters included baseline PSA, maximum length core at prostate biopsy, clinical stage, ISUP grade group and presence of extracapsular extension, seminal vesicles invasion and intraprostatic perineural invasion; MRI variables included index lesion size, length of capsular involvement by tumor, PI-RADS v2 score, ESUR ECE score, overall LIKERT score and LIKERT ECE score. Two experienced radiologists retrospectively reviewed the imaging studies blinded to the final histology. Uni and multivariate analysis were conducted to identify the clinical variables associated to ECE at whole-mount histology of RP specimen; according to the Hazard Ratios of the statistically significant variables, a nomogram was developed and calibrated with the Hosmer-Lemeshow test. Inter-observer variability was tested as appropriate between radiologists for the relevant mpMRI variables.

Results: Intraprostatic perineural invasion at prostate biopsy and length of capsular involvement at MRI (dichotomised as ≤9.5mm>) showed statistical significance correlation in multivariate analysis with the reference standard. The predictive model had a 81.4% of probability to accurately predict ECE at specimen, with a substantial calibration (p=0.985 at Hosmer-Lemeshow test); similarly, at ROC curve analysis of the model, the area under the curve (AUC) was 0.83 [95% CI (0.76-0.90)], p<0.001. Inter-observer variability between radiologists was substantial for index lesion size and length of capsular involvement, and good for PIRADS/ESUR/LIKERT scores.

Conclusions: The length of capsular involvement was the only mpMRI factor significantly associated to the ECE at prostatic specimen. The combination of this variable with the intraprostatic perineural invasion showed a substantial accuracy in predicting predict ECE. The PIRADS/ESUR/LIKERT scores did not show utility for staging.