# ABSTRAK

**Latar belakang :** Respon patologi terhadap kemoterapi neoadjuvan (NAC) pada karsinoma payudara bervariasi, sementara biomarker non invasif untuk memprediksi respon sebelum terapi masih terbatas. Penelitian ini menilai kemampuan parameter multiparameter MRI (mp-MRI), terutama parameter *Dynamic Contrast-Enhanced* MRI (Ktrans, Ve, Kep), volume tumor, dan nilai ADC, serta biomarker jaringan (VEGF dan Ki-67) sebagai prediktor respon patologi.

**Tujuan :** Menilai peran multiparameter MRI (Kep, Ve, Ktrans, FTV, nilai ADC) dan parameter biomolekuler VEGF,Ki67 dalam memprediksi respon patologi *Miller and Payne* (MP) pada pasien kanker payudara setelah kemoterapi neoadjuvan

**Metode Penelitian :** Studi kohort prospektif terhadap 25 pasien karsinoma payudara stadium II-III yang menjalani NAC dan operasi. Respon patologi dinilai dengan sistem *Miller and Payne* (MP) dan dibagi menjadi respon kurang baik (MP 1-3) dan respon baik (MP 4-5). Analisis mencakup kurva ROC untuk cut-off, uji bivariat (*Chi-square/Fisher* dan *risk ratio),* uji multikolinearitas, serta regresi logistik multivariat.

**Hasil Penelitian :** Ktrans dan Ve bermakna lebih tinggi pada kelompok respon kurang baik (p=0,002 dan p=0,004). Ktrans (*cut-off* 0,165 menit$^{-1}$) menghasilkan AUC 0,873 dengan sensitivitas 80,0% dan spesifisitas 70,0%; Ve (cut-off 0,18) menghasilkan AUC 0,787 dengan sensitivitas 93,3% dan NPV 85,7%. Terdapat hubungan dose–response antara Ve dan respon kurang baik (*p-for-trend*=0,004). Pada analisis multivariat gabungan, Ve dan intensitas VEGF merupakan prediktor independen (*Nagelkerke* $R^2$=0,62).

**Simpulan :** Ve dan Ktrans, terutama Ve, merupakan prediktor respon patologi yang menjanjikan, dan integrasinya dengan VEGF jaringan meningkatkan kemampuan prediksi.

**Kata Kunci :** DCE-MRI, Ve, Ktrans, VEGF, kemoterapi neoadjuvan, karsinoma payudara

# ABSTRACT

**Background :** Pathological response to neoadjuvant chemotherapy (NAC) in breast cancer is highly variable, while non-invasive biomarkers for predicting response before therapy remain limited. This study evaluated multiparametric MRI (mp-MR) particularly the Dynamic Contrast-Enhanced MRI perfusion parameters (Ktrans, Ve, Kep), tumour volume, and ADC value together with tissue biomarkers (VEGF and Ki-67) as predictors of pathological response.

**Objectives :** To evaluate the role of multiparametric MRI (Kep, Ve, Ktrans, FTV, ADC value) and biomolecular parameters (VEGF, Ki-67) in predicting Miller and Payne (MP) pathological response in breast cancer patients after neoadjuvant chemotherapy.

**Method :** A prospective cohort study of 25 patients with stage II-III breast carcinoma who underwent NAC and surgery. Pathological response was graded using the Miller and Payne (MP) system and dichotomised into poor response (MP 1-3) and good response (MP 4-5). Analyses comprised ROC curves for cut-off determination, bivariate testing (Chi-square/Fisher and risk ratio), multicollinearity testing, and multivariate logistic regression.

**Results :** Ktrans and Ve were significantly higher in the poor-response group ($p=0.002$ and $p=0.004$). Ktrans (cut-off 0.165 $min^{-1}$) yielded an AUC of 0.873 with 80.0% sensitivity and 70.0% specificity; Ve (cut-off 0.18) yielded an AUC of 0.787 with 93.3% sensitivity and 85.7% NPV. A dose–response relationship between Ve and poor response was observed (p-for-trend=0.004). In the combined multivariate model, Ve and VEGF intensity were independent predictors (Nagelkerke $R^2=0.62$).

**Conclusion :** Ve and Ktrans, especially Ve, are promising predictors of pathological response, and their integration with tissue VEGF improves predictive performance.

***Keywords*** **:** DCE-MRI, Ve, Ktrans, VEGF, neoadjuvant chemotherapy, breast carcinoma