Topic : **Biliary & Pancreas**

# PREDICTION OF NODAL STATUS ON PREOPERATIVE MRI FOR PATIENTS WITH INTRAHEPATIC CHOLANGIOCARCINOMA: AN APPARENT DIFFUSION COEFFICIENT-BASED MACHINE LEARNING MODEL

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**Background** : Nodal (N)-status is a predictor of survival in patients with intrahepatic cholangiocarcinoma (iCCA). Given the risk of postoperative complications, lymphadenectomy benefit remains debated when no positive lymph nodes are detectable at preoperative imaging. This study aims to develop a machine-learning model to predict N-status preoperatively.

**Methods** : Data from iCCA patients undergoing hepatectomy between 2011-2023 were retrospectively analyzed. Lymph node diameter and respective Apparent Diffusion Coefficient (ADC) values were extracted from preoperative MRI. A Support Vector Machine (SVM) model with radial kernel was developed to classify N-status using MRI and clinical data extracted by logistic regression. Class weights to address class imbalance and leave-one-out-cross-validation were performed. The primary endpoint was the model area under the curve (AUC), evaluated by ROC analysis. A 1000-fold bootstrap analysis provided internal validation.

**Results** : A total of 47 lymph nodes were matched to pathological reports, of which 13(27.7%) were metastatic. ADC values significantly differed between N0 and N1 groups (1177 vs 1001mm2/s, p=0.029), whereas diameter did not (14.2 vs 20.0mm, p=0.178). Multifocal disease was the only clinical variable selected by multivariate logistic regression (OR 9.37, 95%CI:1.69-74.8,p = 0.01). The SVM model, incorporating lymph node diameter, ADC values, and multifocal disease status, achieved an AUC of 0.91 (95%CI: 0.83-0.99) with 82.8% sensitivity, 92.3% specificity, 96.0% positive predictive value, and 70.6% negative predictive value. The bootstrap internal validation resulted in an AUC of 0.87 (95%CI:0.81-0.91).

**Conclusions** : The proposed machine-learning model effectively predicts N-status preoperatively. This approach could allow lymphadenectomy to be reserved for patients who most likely benefit from the procedure.

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