

**Background**

Intrahepatic cholangiocarcinoma (iCCA) is an uncommon, aggressive bile duct cancer. Two-thirds of iCCA tumors are surgically unresectable at diagnosis and prognosis for these patients is poor, with median survival time of 2.5-7.5 months in absence of treatment. More than half of unresectable iCCA patients die from tumor-related liver failure (TRLF), a result of the tumor invading and disrupting the nearby parenchyma, vasculature, or bile ducts.

Ablative radiotherapy (ART) has been shown to effectively mitigate TRLF and improve survival, but fewer than 1 in 6 iCCA patients likely to develop TRLF receive this treatment. This stems from the difficulty of prospectively identifying this subgroup of patients. To enable automated identification of iCCA patients likely to develop TRLF, we are developing a model applying the predictive ability of deep convolutional neural networks (CNNs) to an institutional database and pretreatment computed tomography (CT) scans for patients with unresectable iCCA. We predict that intratumoral and peritumoral imaging features of iCCA along with clinicopathologic features can be used by a CNN to accurately predict TRLF.

**Methods**

We will construct a large institutional database that includes manually segmented CT scans, molecular data, and treatment data to train, validate, and test a CNN that can accurately predict whether a patient will develop TRLF. To construct an institutional database for training of the CNN, we will review records of 700+ patients with iCCA.

**Results**

Currently, we have analyzed 175 patients who underwent radiotherapy for unresectable iCCA at MD Anderson from 2002-2021. TRLF was found to be the cause of death in 13 of 83 patients with a known cause of death.

**Conclusions**

Our preliminary data indicate a range of outcomes for patients and variables that may be useful to develop a CNN to predict TRLF. Looking forward, we will expand on our efforts to annotate patient data as well as manually segment CT scans of these patients for training of the CNN models.

**References**