Budding-T-cell score is a potential predictor for more aggressive treatment in pT1 colorectal cancers

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Introduction

As pT1 colorectal cancers (CRC) tend to be overtreated, we investigate the previously proposed BTS (budding-T-cell-score = (#tumor-buds+1)/(#T-cells+1)) as a predictive marker to assess patients' need for resection. BTS was shown to be a better predictor of survival and other clinical factors than individual scoring.

Materials and Methods

We consider hotspots annotated by a pathologist according to the ITBCC guidelines on double-stained (AE1-AE3 pan-cytokeratin and CD8+) WSI from our pT1 CRC cohort (N=573). Within hotspots, tumor-buds and T-cells are automatically detected using convolutional neural networks and counted. The patients are divided into two groups based on their need for resection (no: N0 / follow-up without recurrence; yes: N1 / follow-up with recurrence). The dataset is imbalanced (89.2%/10.8%). To predict the patient group, we train a support-vector machine with data-balancing using the tumor-buds or T-cell counts individually, together, and just the BTS. We report the weighted accuracy, and sensitivity and specificity for the “yes” group.

Results

The highest weighted accuracy (62.8±6.5%) and precision (17.6±3.7%) are achieved using the tumor-buds count. Using the BTS achieves a sensitivity of 98.3±2.9%, which outperforms the other models by more than 30%.

Conclusion

We show that combined assessment of tumor-buds and T-cells has the potential to serve as a predictive marker for the need of resection in pT1 cancers. However, there is still much room for improvement, as the low specificity still leads to overtreatment. We aim to address this in future work by also considering the spatial relationship of tumor-buds and T-cells and other predictive factors of nodal metastasis.