Bruton's tyrosine kinase

Bruton's tyrosine kinase (BTK) is a protein kinase that plays a crucial role in the development and functioning of B cells, a type of white blood cell involved in the immune system. BTK is a key component of the B-cell receptor (BCR) signaling pathway, which is essential for B-cell activation, differentiation, and antibody production.

Here are some key points about Bruton's tyrosine kinase:

Structure:

BTK is a cytoplasmic tyrosine kinase, meaning it is located within the cell's cytoplasm. It consists of several domains, including a pleckstrin homology (PH) domain, a Tec homology (TH) domain, a Src homology 3 (SH3) domain, and a tyrosine kinase (TK) domain. Function:

BTK is primarily expressed in B cells and is a crucial component of the BCR signaling pathway. When BCR is engaged by an antigen, it activates BTK, leading to a cascade of signaling events that ultimately result in B-cell activation and immune response. B-Cell Development:

Mutations in the BTK gene can lead to a primary immunodeficiency disorder known as X-linked agammaglobulinemia (XLA). XLA is characterized by the absence of mature B cells, resulting in a severe impairment of the immune system and increased susceptibility to infections. Signaling Pathway:

Upon BCR engagement, BTK is activated through a series of phosphorylation events. Activated BTK then phosphorylates downstream targets, including phospholipase C gamma 2 (PLCγ2), leading to the release of intracellular calcium ions and activation of various transcription factors. Clinical Significance:

BTK has become a target for therapeutic intervention in certain diseases, particularly B-cell malignancies. Inhibitors of BTK, such as ibrutinib, have been developed and approved for the treatment of B-cell cancers, including chronic lymphocytic leukemia (CLL) and mantle cell lymphoma (MCL). Inhibitors:

BTK inhibitors, such as ibrutinib and acalabrutinib, are small molecules that block the activity of BTK. By inhibiting BTK, these drugs interfere with B-cell signaling, leading to the suppression of abnormal B-cell proliferation in certain cancers. Autoimmune Diseases:

BTK inhibitors are also being explored as potential treatments for autoimmune diseases, where abnormal B-cell activation contributes to the pathogenesis. Ongoing Research:

Ongoing research continues to uncover the intricate details of BTK's role in various immune responses and diseases. This knowledge contributes to the development of targeted therapies and a deeper understanding of immune system regulation. Understanding the role of Bruton's tyrosine kinase in B-cell signaling has provided valuable insights into both normal immune function and diseases related to B-cell dysregulation. The development of BTK inhibitors represents a significant advancement in the field of targeted therapies for certain cancers and autoimmune disorders.

Jiang et al. aimed to study whether Bruton's tyrosine kinase (BTK) expression is correlated with the

prognosis of patients with high-grade gliomas (HGGs) and predict its expression level before surgery, by constructing radiomic models. Clinical and gene expression data of 310 patients from The Cancer Genome Atlas (TCGA) were included for gene-based prognostic analysis. Among them, contrast-enhanced T1-weighted imaging (T1WI + C) from The Cancer Imaging Archive (TCIA) with genomic data was selected from 82 patients for radiomic models, including support vector machine (SVM) and logistic regression (LR) models. Furthermore, the nomogram incorporating radiomic signatures was constructed to evaluate its clinical efficacy. BTK was identified as an independent risk factor for HGGs through univariate and multivariate Cox regression analyses. Three radiomic features were selected to construct the SVM and LR models, and the validation set showed area under curve (AUCs) values of 0.711 (95% CI, 0.598-0.824) and 0.736 (95% CI, 0.627-0.844), respectively. The median survival times of the high Rad_score and low-Rad_score groups based on the LR model were 15.53 and 23.03 months, respectively. In addition, the total risk score of each patient was used to construct a predictive nomogram, and the AUCs calculated from the corresponding time-dependent ROC curves were 0.533, 0.659, and 0.767 for 1, 3, and 5 years, respectively. BTK is an independent risk factor associated with poor prognosis in patients, and the radiomic model constructed in this study can effectively and non-invasively predict preoperative BTK expression levels and patient prognosis based on T1WI + C [1)].

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Jiang C, Sun C, Wang X, Ma S, Jia W, Zhang D. BTK Expression Level Prediction and the High-Grade Glioma Prognosis Using Radiomic Machine Learning Models. J Imaging Inform Med. 2024 Feb 21. doi: 10.1007/s10278-024-01026-9. Epub ahead of print. PMID: 38381384.