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News & Comments

Propranolol-treated individuals ought to be careful undergoing thorough MRI scan

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The focus of traditional pharmacology is on the effects of various medications and their relative proportions to their concentrations, as well as drug interactions with receptors. Drug plasma concentrations are commonly measured and used as a substitute for drug concentrations because the former is responsible for maintaining drug concentration balance in other regions of the human body. When two or more medications interact, the pharmacokinetic behaviour of one or both pharmaceuticals may be affected, resulting in complications, adverse effects, or secondary interactions. These interactions, also known as drug-drug interactions (DDIs), can occur as a result of antagonism between two drugs when taken together, or vice versa.

Propranolol is an adrenergic antagonist used to treat a variety of medical disorders including heart failure, tachycardia, cardiovascular disease, atrial fibrillation, and coronary artery disease. Additionally, they have been prescribed for the treatment of hypertension as well as the aforementioned heart diseases and consequences. The reduction in heart workload and oxygen demand is achieved by blocking adrenergic receptors. Blockers, like other medications, are broken down largely in the liver, with less than half of the substance reaching the systemic circulation.

The analysis was performed using ChemDIS-Mixture, which is an online tool that sequesters data from extensively curated online databases of diseases, pathways, proteins and helps to decipher the possible interactions between two drugs.

This study was carried out from August 2020 to April 2021 in the Laboratory of Molecular Simulations, Department of Medical Imaging, Jiangsu Taizhou People's Hospital, Taizhou, Jiangsu Province, 225300, China. For the prediction of a probable drug-drug interaction between Propranolol and Omniscan, the most recent version of ChemDIS-Mixture (v.5.0) was utilized. The confidence level was set at medium (0.4). The research was carried out using a schematic method. Before the parameters of the hypergeometric analysis were adjusted (Benjamini-Hochberg multiple test correction, $p<0.05$) for the analysis of GO, DO, and DOLite terms, as well as the proteins and molecular signalling pathways associated with the co-prescription of both drugs, the drug, was entered into each search bar of the database.

ChemDIS-Mixture is an online hub that collects data from a variety of interconnected databases, including PubChem. This software also contains information on a wide range of target proteins, as well as their two- and three-dimensional structures. The unique impacts of multiple target proteins,

signalling pathways, GO, DO, and DOLite terms, combined in Microsoft Excel®, as well as Venn diagrams that show drug-drug interactions between two medications, are displayed in this software's predictive analysis. The effects of the combination of Propranolol and Omniscan co-administration were illustrated using ChemDIS-predictive Mixture's analysis. In the form of impacted proteins, GO terms, DO and DOLite terms, Venn diagrams depicted the combined effects of both medicines.

Understanding probable Drug-Drug Interactions (DDIs) between two medications is critical for both drug safety and lowering the likelihood of adverse drug reactions in unwitting patients. The most common discussion of both words focuses on the pharmacokinetics and pharmacodynamics of both drugs to determine which drug has an adverse reaction to the other and vice versa. When gadolinium-based contrast agents and beta-blockers are used combined in high-risk patients, there is an elevated risk of hypersensitivity events. The CYP2D6 enzyme is responsible for the majority of the drug's metabolism in the liver. However, if another medication is taken with it, it can have substantial side effects, as evidenced by the current study, which looked into the consequences of taking Propranolol and Omniscan together. Due to competitive inhibition, Omniscan, a gadolinium-based MR imaging contrast agent, can behave as a CYP2D6 substrate, boosting Propranolol concentrations in serum. When both treatments must be given to the same patient, it is therefore critical to carefully control the dosage and delivery of both drugs.

JOURNAL REFERENCE

Zhang, T., Z. Zhou, Y. Wang and J. Xia, 2022. An in silico modeling for the prediction of propranolol-omniscan interaction. Int. J. Pharmacol., 18: 96-103.

KEYWORDS

Drug-drug interactions, ChemDIS-Mixture, Propranolol, Omniscan, Propranolol-treated patients, MRI scan