World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:10, No:12, 2016

Expert Supporting System for Diagnosing Lymphoid Neoplasms Using Probabilistic Decision Tree Algorithm and Immunohistochemistry Profile Database

Authors : Yosep Chong, Yejin Kim, Jingyun Choi, Hwanjo Yu, Eun Jung Lee, Chang Suk Kang

Abstract : For the past decades, immunohistochemistry (IHC) has been playing an important role in the diagnosis of human neoplasms, by helping pathologists to make a clearer decision on differential diagnosis, subtyping, personalized treatment plan, and finally prognosis prediction. However, the IHC performed in various tumors of daily practice often shows conflicting and very challenging results to interpret. Even comprehensive diagnosis synthesizing clinical, histologic and immunohistochemical findings can be helpless in some twisted cases. Another important issue is that the IHC data is increasing exponentially and more and more information have to be taken into account. For this reason, we reached an idea to develop an expert supporting system to help pathologists to make a better decision in diagnosing human neoplasms with IHC results. We gave probabilistic decision tree algorithm and tested the algorithm with real case data of lymphoid neoplasms, in which the IHC profile is more important to make a proper diagnosis than other human neoplasms. We designed probabilistic decision tree based on Bayesian theorem, program computational process using MATLAB (The MathWorks, Inc., USA) and prepared IHC profile database (about 104 disease category and 88 IHC antibodies) based on WHO classification by reviewing the literature. The initial probability of each neoplasm was set with the epidemiologic data of lymphoid neoplasm in Korea. With the IHC results of 131 patients sequentially selected, top three presumptive diagnoses for each case were made and compared with the original diagnoses. After the review of the data, 124 out of 131 were used for final analysis. As a result, the presumptive diagnoses were concordant with the original diagnoses in 118 cases (93.7%). The major reason of discordant cases was that the similarity of the IHC profile between two or three different neoplasms. The expert supporting system algorithm presented in this study is in its elementary stage and need more optimization using more advanced technology such as deep-learning with data of real cases, especially in differentiating T-cell lymphomas. Although it needs more refinement, it may be used to aid pathological decision making in future. A further application to determine IHC antibodies for a certain subset of differential diagnoses might be possible in near future.

Keywords : database, expert supporting system, immunohistochemistry, probabilistic decision tree
Conference Title : ICDISLS 2016 : International Conference on Data Integration Systems in the Life Sciences
Conference Location : Rome, Italy
Conference Dates : December 08-09, 2016