Is predicting metastatic pheochromocytoma and paraganglioma still effective without using methoxytyramine?
Saygili, Emre Sedar; Elhassan, Yasir; Ronchi, Cristina

DOI: 10.1016/S2589-7500(24)00019-0

License: Creative Commons: Attribution-NonCommercial-NoDerivs (CC BY-NC-ND)

Document Version Publisher's PDF, also known as Version of record

https://doi.org/10.1016/S2589-7500(24)00019-0

Link to publication on Research at Birmingham portal

General rights
Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

• Users may freely distribute the URL that is used to identify this publication.
• Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
• Users may use extracts from the document in line with the concept of ‘fair dealing’ under the Copyright, Designs and Patents Act 1988 (?)
• Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

Take down policy
While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact UBIRA@lists.bham.ac.uk providing details and we will remove access to the work immediately and investigate.

Download date: 09. Mar. 2024
Is predicting metastatic phaeochromocytoma and paraganglioma still effective without methoxytyramine?

We were intrigued by a recent Article from Christina Pamporaki and colleagues published in The Lancet Digital Health about using machine learning to predict the development of metastases in phaeochromocytoma and paraganglioma (PPGL).1 PPGLs have a metastatic rate of up to 20%. Although all PPGLs have the potential to metastasise, no clinical or histopathological methods are currently available to predict metastatic disease.1

Pamporaki and colleagues introduced a model to predict metastasis using nine parameters. The top three most important features in the model were a previous history of PPGL, tumour location, and tumour volume. Including a SDHB mutation status did not significantly enhance the model’s accuracy. Plasma methoxytyramine and metanephrine concentrations ranked as the fourth and fifth parameters, respectively, with similar scores.

Due to inherently low concentrations of methoxytyramine, standard assays are unsuitable for measurements. Liquid chromatography with tandem mass spectrometry can be used to detect methoxytyramine with superior analytical sensitivity and selectivity, but it is not widely available in clinical laboratories. Therefore, measurements of methoxytyramine are not universally included in the screening of PPGL.1 We questioned whether we could build an effective PPGL metastasis prediction model without methoxytyramine and create machine learning models from the published dataset.1

We used the PyCaret 3.04 methoxytyramine library in Python to create and compare models. After removing missing data rows, models were created using ten-fold cross-validation on 747 patients, with 522 in the training set and 225 in the test set. Assessing the model’s robustness involved rigorous training on a subset of data followed by testing on an unseen hold-out dataset. The Categorical Boosting Classifier had the highest scores for the area under the receiver operating characteristic curve (AUC) of 0·946, with an accuracy of 0·900 on the training dataset. Other models and corresponding explanations are available in the appendix. The model without methoxytyramine’s prediction on the test dataset had an accuracy of 0·893, AUC of 0·919, 72% sensitivity, and 95% specificity.

Pamporaki’s best model achieved an accuracy of 0·907, AUC of 0·942, 83% sensitivity, and 92% specificity.1 The performance of the model without methoxytyramine decreased slightly, but its AUC remained greater than 0·9 with an even higher specificity than the model with methoxytyramine proposed by Pamporaki and colleagues (95% vs 92%). Our model could therefore be universally applied for PPGL metastasis prediction.

Machine learning models are being increasingly used in health care and to support medical decisions. Therefore, we created a Web-App tool accessible for clinicians to obtain a probability risk rate to predict metastasis in patients with PPGL using eight parameters. CLR holds a research grant from HRA Pharma Rare Disease as Principal Investigator (payment to the University of Birmingham). ESS holds grants from CA20122—Harmonizing Clinical Care and Research on Adrenal Tumours in European Countries (HARMONISATION) and the Turkish Society of Endocrinology and Metabolism. ESS and YSE declare no competing interests.

See Online for appendix

References


Correspondence

Canakkale, Turkey (ESS); Institute of Metabolism and Systems Research, College of Medical and Dental Science, University of Birmingham, Birmingham B15 2TT, UK (ESS, YSE, CLR); Centre for Endocrinology, Diabetes and Metabolism, Birmingham Health Partners, Birmingham, UK (YSE, CLR)

For more on the app see https://pheo-met.streamlit.app