

PRESS RELEASE

Cancer Diagnostics: New Factor Simplifies Classification of Brain Tumours

Thanks to a team from Karl Landsteiner University of Health Sciences in Krems (Austria), standardised classification of the aggressiveness of tumours based on their shape is now possible.

Krems, 30th November 2021 – Objective assessment of irregularities in a tumour’s shape provides a means to evaluate its aggressiveness more effectively prior to an operation. This was the key finding made by a team of physicians from Karl Landsteiner University of Health Sciences in Krems whose research focused on meningiomas, a form of tumour that affects the meningeal tissue in the brain. In a study published in the latest issue of the Journal of Neurosurgery, the research team demonstrated the high predictive value of the model they developed and named the surface factor. The model represents an objective and comparable parameter for the quantification of irregularities in tumour shape. Based on data from more than 125 patients, the study found a statistically significant correlation between a low surface factor (i.e. an irregular tumour surface) and a higher level of aggressiveness in the tumour.

Although meningiomas – tumours that develop in the meninges – are often benign, around 20% of cases are characterised by a higher degree of aggressiveness. Distinctions are drawn using the WHO classification, which grades tumours from I to III once they have been surgically removed and also determines the subsequent treatment regimen. However, pre-operative classification would be highly beneficial, as it would provide the surgeon with vital advance information on the best suited surgical strategy. A group of physicians from Karl Landsteiner University of Health Sciences in Krems (KL Krems) has now demonstrated that the factor they calculated provides precisely this type of information.

“Superficial” Examination

“The starting point for our analysis is very simple,” explains Dr. Franz Marhold of the Clinical Department of Neurosurgery at KL Krems University Hospital in St Pölten. “Experience shows that tumours, especially meningiomas, with irregular surface tend to be more aggressive. This means we need a parameter for the objective quantification and comparison of irregularities in tumours. And this is exactly what we have achieved with the surface factor.”

Magnetic resonance imaging of a tumour provides the foundations for determining the surface factor (SF), which enables the surface area and volume of the tumour to be calculated using specialist software. In the second step, the surface area of a hypothetical sphere with the same volume as the tumour is calculated. As Dr. Popadic, first author of the

study, points out: “Of all geometric forms, a sphere has the smallest surface area relative to its volume. In other words, it represents a sort of ‘idealised’ tumour with the smallest possible number of irregularities.” The SF is then calculated as the ratio of the sphere’s surface area to that recorded for the tumour. The more irregularities, the lower the SF.

Clear Data Set

In order to highlight the predictive value of the SF, Dr. Marhold, Dr. Popadic and their team collected data from 126 patients who had meningiomas removed at two neurosurgical centres in Austria between 2010 and 2018. The retrospective study demonstrated that distinctions can be made with a high degree of statistical accuracy between the WHO grades I-III using the SF. Further analysis showed that the SF is independent of other values and can therefore serve as an easily calculable pre-operative prognostic factor for the aggressivity of a meningioma.

Generally speaking, the team has devised a mathematical model that enables objective and quantitative pre-operative evaluation of the shape of meningiomas, as described in the work which has now been published in the Journal of Neurosurgery. Going forward, this new predictive tool could help to optimise surgical strategies and contribute to improved treatment outcomes. The work underlines once again KL Krems’ research-based approach to promoting continuous innovation in medicine, with a view to enhancing patients’ wellbeing.

Original Publication: The meningioma surface factor: a novel approach to quantify shape irregularity on preoperative imaging and its correlation with WHO grade. B. Popadic, F. Scheichel, D. Pinggera, M. Weber, K. Ungersboeck, M. Melitta Kitzwoegerer, T. Roetzer, S. Oberndorfer, C. Sherif, C. F. Freyschlag & F. Marhold. J Neurosurg October 8, 2021. DOI: 10.3171/2021.5.JNS204223

About Karl Landsteiner University of Health Sciences

At Karl Landsteiner University of Health Sciences (KL) in Krems, the comprehensive approach to health and disease is a fundamental objective for research and teaching. With its Europe-wide recognized bachelor-master system, KL is a flexible educational institution that is tailored to the needs of students, the requirements of the labor market as well as the scientific challenges. Currently KL hosts about 600 students in the fields of medicine and psychology. The four university hospitals in Krems, St. Pölten, Tulln and Eggenburg ensure clinical teaching and research at the highest quality level. In research, KL focuses on interdisciplinary fields with high relevance to health policy - including medical technology, molecular oncology, mental health and neuroscience, as well as water quality and related health aspects. KL was founded in 2013 and accredited by the Austrian Agency for Quality Assurance and Accreditation (AQ Austria). www.kl.ac.at/en

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