Journal of
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Section

Methodology, Drug and Device Discovery

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Section Editor-in-Chief

Prof. Dr. Kallol Ray Chaudhuri

Section Information

The Section "Methodology, Drug and Device Discovery" takes a multifaceted and collaborative approach to promoting the development of innovative, personalized therapies for those with respiratory diseases, critical illness, sleep disorders, chronic diseases, infectious diseases, and genetic diseases. This Section aims to provide the latest relevant and credible research that focuses on identifying and instilling principles of translational and clinical science, together with strategies and specific methods to distribute knowledge surrounding the discovery and development of new drugs and devices, which relates to the art and principles of personalized medicine.

This Section will also support applications proposing preclinical discovery of biotechnology products and biologics with potential as candidate therapeutics including, but not limited to, large biologic macromolecules (e.g., proteins, antibodies, and peptides), gene-based therapies (i.e., oligonucleotide- and viral vector-based), cell therapies, and novel emerging personalized therapies.

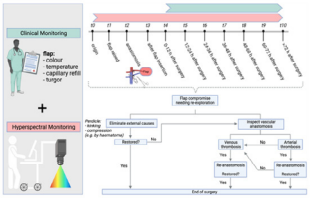
Similarly, submissions are encouraged in relation to the development of new devices to monitor and measure symptoms and signs of chronic diseases which may provide a granular insight into home monitoring as well as remote care and facilitate personalized healthcare by providing a dashboard of symptoms. Such devices may include wearable sensors, disease bespoke apps, as well as combined devices.

Feature papers

DOI:10.3390/jpm11111101

New Approach to the Old Challenge of Free Flap Monitoring—Hyperspectral Imaging Outperforms Clinical Assessment by Earlier Detection of Perfusion Failure

Authors: Daniel G. E. Thiem, Paul Römer, Sebastian Blatt, Bilal Al-Nawas and Peer W. Kämmerer

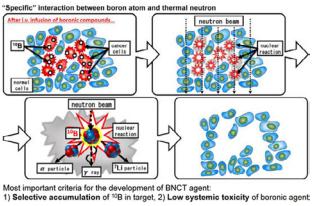


Abstract: In reconstructive surgery, free flap failure, especially in complex osteocutaneous reconstructions, represents a significant clinical burden. Therefore, the aim of the presented study was to assess hyperspectral imaging (HSI) for monitoring of free flaps compared to clinical monitoring. In a prospective, non-randomized clinical study, patients with free flap reconstruction of the oro-maxillofacial-complex were included. Monitoring was assessed clinically and by using hyperspectral imaging (TIVITA™ Tissue-System, DiaspectiveVision GmbH, Pepelow, Germany) to determine tissue-oxygen-saturation [StO_2], near-infrared-perfusion-index [NPI], distribution of haemoglobin [THI] and water [TWI], and variance to an adjacent reference area (Δreference). A total of 54 primary and 11 secondary reconstructions were performed including fasciocutaneous and osteocutaneous flaps. Re-exploration was performed in 19 cases. A total of seven complete flap failures occurred, resulting in a 63% salvage rate. Mean time from flap inset to decision making for re-exploration based on clinical assessment was 23.1 ± 21.9 vs. 18.2 ± 19.4 h by the appearance of hyperspectral criteria indicating impaired perfusion ($StO_2 \leq 32\%$ OR StO_2Δreference > −38% OR NPI ≤ 32.9 OR NPIΔreference ≥ −13.4%) resulting in a difference of 4.8 ± 5 h ($p < 0.001$). HSI seems able to detect perfusion compromise significantly earlier than clinical monitoring. These findings provide an interpretation aid for clinicians to simplify postoperative flap monitoring.

DOI:10.3390/jpm11080825

A Critical Review of Radiation Therapy: From Particle Beam Therapy (Proton, Carbon, and BNCT) to Be

Authors: Yoshitaka Matsumoto, Nobuyoshi Fukumitsu, Hitoshi Ishikawa, Kei Nakai and Hideyuki Sakurai

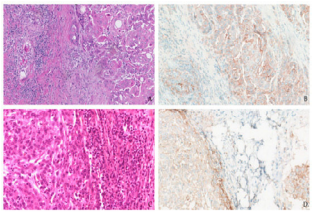


Abstract: In this paper, we discuss the role of particle therapy—a novel radiation therapy (RT) that has shown rapid progress and widespread use in recent years—in multidisciplinary treatment. Three types of particle therapies are currently used for cancer treatment: proton beam therapy (PBT), carbon-ion beam therapy (CIBT), and boron neutron capture therapy (BNCT). PBT and CIBT have been reported to have excellent therapeutic results owing to the physical characteristics of their Bragg peaks. Variable drug therapies, such as chemotherapy, hormone therapy, and immunotherapy, are combined in various treatment strategies, and treatment effects have been improved. BNCT has a high dose concentration for cancer in terms of nuclear reactions with boron. BNCT is a next-generation RT that can achieve cancer cell-selective therapeutic effects, and its effectiveness strongly depends on the selective 10B accumulation in cancer cells by concomitant boron preparation. Therefore, drug delivery research, including nanoparticles, is highly desirable. In this review, we introduce both clinical and basic aspects of particle beam therapy from the perspective of multidisciplinary treatment, which is expected to expand further in the future.

DOI:10.3390/jpm12071073

Atlas of PD-L1 for Pathologists: Indications, Scores, Diagnostic Platforms and Reporting Systems

Authors: Stefano Marletta, Nicola Fusco, Enrico Munari, Claudio Luchini, Alessia Cimadamore, Matteo Brunelli, Giulia Querzoli, Maurizio Martini, Elena Vigliar, Romano Colombari, Ilaria Girolami, Fabio Pagni and Albino Eccher

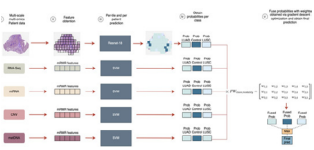


Abstract: Background. Innovative drugs targeting the PD1/PD-L1 axis have opened promising scenarios in modern cancer therapy. Plenty of assays and scoring systems have been developed for the evaluation of PD-L1 immunohistochemical expression, so far considered the most reliable therapeutic predictive marker. Methods. By gathering the opinion of acknowledged experts in dedicated fields of pathology, we sought to update the currently available evidence on PD-L1 assessment in various types of tumors. Results. Robust data were progressively collected for several anatomic districts and leading international agencies to approve specific protocols: among these, TPS with 22C3, SP142 and SP263 clones in lung cancer; IC with SP142 antibody in breast, lung and urothelial tumors; and CPS with 22C3/SP263 assays in head and neck and urothelial carcinomas. On the other hand, for other malignancies, such as gastroenteric neoplasms, immunotherapy has been only recently introduced, often for particular histotypes, so specific guidelines are still lacking. Conclusions. PD-L1 immunohistochemical scoring is currently the basis for allowing many cancer patients to receive properly targeted therapies. While protocols supported by proven data are already available for many tumors, dedicated studies and clinical trials focusing on harmonization of the topic in other still only partially explored fields are surely yet advisable.

DOI:10.3390/JPM12040601

Machine-Learning-Based Late Fusion on Multi-Omics and Multi-Scale Data for Non-Small-Cell Lung Cancer Diagnosis

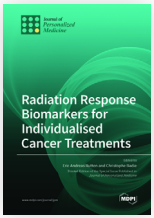
Authors: Francisco Carrillo-Perez , Juan Carlos Morales, Daniel Castillo-Secilla, Olivier Gevaert , Ignacio Rojas and Luis Javier Herrera



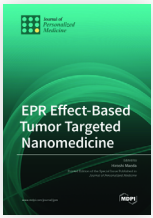
Abstract: Differentiation between the various non-small-cell lung cancer subtypes is crucial for providing an effective treatment to the patient. For this purpose, machine learning techniques have been used in recent years over the available biological data from patients. However, in most cases this problem has been treated using a single-modality approach, not exploring the potential of the multi-scale and multi-omic nature of cancer data for the classification. In this work, we study the fusion of five multi-scale and multi-omic modalities (RNA-Seq, miRNA-Seq, whole-slide imaging, copy number variation, and DNA methylation) by using a late fusion strategy and machine learning techniques. We train an independent machine learning model for each modality and we explore the interactions and gains that can be obtained by fusing their outputs in an increasing manner, by using a novel optimization approach to compute the parameters of the late fusion. The final classification model, using all modalities, obtains an F1 score of 96.81±1.07, an AUC of 0.993±0.004, and an AUPRC of 0.980±0.016, improving those results that each independent model obtains and those presented in the literature for this problem. These obtained results show that leveraging the multi-scale and multi-omic nature of cancer data can enhance the performance of single-modality clinical decision support systems in personalized medicine, consequently improving the diagnosis of the patient.

Special Issue Books:

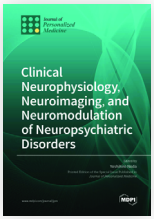
Radiation Response Biomarkers for Individualised Cancer Treatments



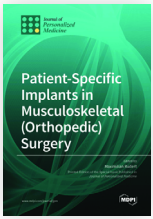
EPR Effect-Based Tumor Targeted Nanomedicine



Clinical Neurophysiology, Neuroimaging, and Neuromodulation of Neuropsychiatric Disorders



Patient-Specific Implants in Musculoskeletal (Orthopedic) Surgery



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