

Spatial profiling technologies for research and clinical application in head and neck squamous cell cancers

Autorzy

Artur Nieszporek

Małgorzata Wierzbicka

Aadil Khan

Mateusz Jeziorny

Patryk Kraiński

Joanna Cybińska

Patrycja Gazińska

Rok wydania

2025

Czasopismo

Current Research in
Biotechnology

Numer woluminu

10

Strony

100321/1-100321/11

DOI

10.1016/j.crbiot.2025.100321

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

The efficacy of clinical treatment in head and neck squamous cell carcinoma (HNSCC) may be influenced by interactions within the tumor microenvironment (TME), involving non-malignant cells such as tumor-infiltrating lymphocytes (TILs) and cancer-associated fibroblasts (CAFs). These cells are crucial parts of the complex and dynamic TME. High-throughput spatial profiling technologies show remarkable potential in identifying predictive biomarkers in HNSCC's TME. Despite advancements in molecular characterization, the translation of these insights into clinical practice remains limited. Understanding these interactions and the TME is pertinent for developing effective therapies and pinpointing biomarkers that predict treatment responses. Spatial profiling also provides comprehensive insights into the cancer multi-omics by characterizing diverse and heterogeneous cell type, cell density, location, and intercellular interactions within the TME. HNSCC continues to be a major global health issue with rising incidence and mortality rates. Although immunotherapies have been effective for some, they benefit only a subset of patients. Spatial profiling helps uncover actionable biomarkers by exposing tumor heterogeneity and immune system interactions, paving the way for more precise medicine in HNSCC. Although the clinical application of multi-omics tumor profiling is still nascent, these technologies hold promise in enhancing our understanding of HNSCC biology and immunoncology, guiding future precision-treatment strategies. This review outlines the applications of high-throughput spatial profiling technologies in both research and clinical settings for HNSCC, highlighting their potential to improve therapeutic strategies through an enhanced understanding of the HNSCC microenvironment. The successful integration of spatial profiling technologies into HNSCC research and clinical practice depends on a standardized, multicenter pipeline that ensures data consistency, seamless integration, and scalability. By combining high-resolution spatial transcriptomics with clinical and genomic insights, this approach has the potential to refine biomarker discovery, enhance patient stratification, and optimize immunotherapy strategies, ultimately paving the way for more precise and effective cancer treatments.

Słowa kluczowe

Spatial profiling, Spatial transcriptomics, HNSCC, Translational research, Clinical application, Tumor microenvironment

Licencja otwartego dostępu

CC-BY-NC-ND

Licencja ta zezwala na rozpowszechnianie, przedstawianie i wykonywanie utworu jedynie w celach niekomercyjnych oraz pod warunkiem zachowania go w oryginalnej postaci (nie tworzenia utworów zależnych). Jest to najbardziej restrykcyjna z licencji.

Pełny tekst licencji: <https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>

Adres publiczny

<http://dx.doi.org/10.1016/j.crbiot.2025.100321>

Strona internetowa wydawcy

<http://www.elsevier.com>