SKIN CANCER (OTHER THAN MELANOMA)

CHEMICAL IMAGING OF AGGRESSIVE BASAL CELL CARCINOMA USING TIME-OF-FLIGHT SECONDARY ION MASS SPECTROMETRY

O Zaar [1] - M Munem [2] - K Dimovska Nilsson [2] - N Neittaanmäki [3] - J Paoli [1] - J Fletcher [2]

Department Of Dermatology And Venereology, Sahlgrenska University Hospital, Institute Of Clinical Sciences At The Sahlgrenska Academy, University Of Gothenburg, Gothenburg, Sweden [1] - Department Of Chemistry And Molecular Biology, University Of Gothenburg, Gothenburg, Sweden [2] - Department Of Pathology, Institute Of Clinical Sciences, Sahlgrenska Academy, University Of Gothenburg, Gothenburg, Sweden [3]

Background: Basal cell carcinoma (BCC) is the most common cancer in humans. There is a growing interest to better understand the role that alterations in lipid metabolic enzymes and their pathways have on oncogenesis. In regards to BCC, studies have shown that there are significantly increased levels of total lipids and phospholipids in these tumors when compared to healthy skin tissue. However, these analyses are made with old methods not being able to identify which cells are affected due to poor resolution and no clear connection to cancer metabolism can be made. Advances in the Time of Flight Secondary Ion Mass Spectrometry (ToF-SIMS) technique nowadays enables the study of chemical changes in individual cells which has not been able before. This helps to elucidate which lipids are connected to cancerous tissue and which is connected to normal structures.

Objective: To map the chemical composition of lipids in BCCs using ToF-SIMS.

Material and Methods: Nine patients with histopathologically verified aggressive BCCs were included in the study. The tissue was fresh frozen and collected from Mohs surgery and was analyzed via ToF-SIMS using a gas cluster ion beam to increase sensitivity.

Results: ToF-SIMS was able to identify different lipids in healthy and cancerous tissue with distinct mass spectral signals were detected from different regions of the tissue (epidermis, dermis, hair follicles, sebaceous glands, scar tissue and cancerous tissue) which allowed for mass spectral comparison to standard histopathology. The cancerous regions of the tissue showed a particular increase in sphingomyelin along with increased specific phosphatidylserine and phosphatidylinositol signals observed in negative ion mode. Samples containing mixed more and less aggressive tumor regions showed increased phosphatidylcholine lipid.

Conclusion: ToF-SIMS can be used to identify the lipid composition of BCCs.