Basal cell carcinoma and photodynamic therapy

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Thesis title: Aspects of selection and treatment of basal cell carcinoma for photodynamic therapy

Basal cell carcinoma (BCC) is the most common type of cancer among people with light skin and occurs most frequently on sun-exposed skin. BCC very rarely spreads to other organs but can cause significant tissue damage in the skin. Photodynamic therapy (PDT) is a minimally invasive treatment option for BCC and combines the effects of a photosensitive topical medication, red light, and oxygen. PDT is not suitable for thick and aggressive BCCs because the medication and light penetrate the skin to a limited degree. Therefore, PDT is only recommended for superficial and nodular BCCs with a thickness of less than 2 mm. Standard PDT treatment for BCC involves two treatments with 7-10 days apart.

The purpose of this work was to investigate whether the selection of BCCs for PDT could be improved and whether the PDT procedure itself could be simplified.

In Paper I, we compared clinical and microscopic assessments of the subtype and thickness of BCC. We evaluated whether clinical diagnosis was sufficient to identify BCCs suitable for PDT. We found that there was generally low agreement between clinical and microscopic assessment of BCC subtype and thickness. This suggests that microscopic

examination should be performed before PDT. However, clinical assessment was good at identifying superficial BCCs suitable for PDT.

In Paper II, an exploratory study, older material consisting of BCCs with complete and incomplete responses to PDT was stained with the markers of aggressiveness and invasiveness β-catenin, E-cadherin, and α-smooth muscle actin (SMA), examining whether these immunohistochemical markers could have potential for predicting PDT response. We found that increased E-cadherin expression, as well as increased expression of β-catenin in connective tissue and at the deep, invasive tumour edge, could potentially predict PDT response. More studies are needed to determine whether these findings have clinical value.

In Paper III, we investigated whether PDT could be simplified to improve logistics and reduce costs and resource use. We conducted a large, randomized, controlled trial at seven treatment centres comparing simplified PDT, i.e. one treatment with the possibility of repeated treatment if no response was seen after three months, with standard PDT, i.e. two treatments with 7-10 days apart. We found that simplified PDT was inferior to standard PDT. Therefore, we recommend standard PDT for BCC where this treatment is indicated.

Papers

1. Mørk E, Mjønes P, Foss OA, et al. Clinical versus Histological Assessment of Basal Cell Carcinoma Subtype and Thickness of Tumours Selected for Photodynamic Therapy. Acta Derm Venereol. 2024 May 15;104:adv18308. doi: 10.2340/actadv.v104.18308. PMID: 38751175; PMCID: PMC11110808.
2. Mørk E, Mjønes P, Foss OA, et al. Expression of β-Catenin, E-Cadherin, and α-Smooth Muscle Actin in Basal Cell Carcinoma Before Photodynamic Therapy in Non-recurrent and Recurrent Tumors: Exploring the Ability of Predicting Photodynamic Therapy Outcome. J Histochem Cytochem. 2023 Mar;71(3):111-120. doi: 10.1369/00221554231161396. Epub 2023 Mar 24. PMID: 36961748; PMCID: PMC10084567.
3. Christensen E, Mørk E, Foss OA, et al. New, simplified versus standard photodynamic therapy (PDT) regimen for superficial and nodular basal cell carcinoma (BCC): A single-blind, non-inferiority, randomised controlled multicentre study. PLoS One. 2024 Mar 8;19(3):e0299718. doi: 10.1371/journal.pone.0299718. PMID: 38457386; PMCID: PMC10923430.