

Introduction and Aim: The increasing number of solid organ transplants has led to a growing population of patients who, in the post-transplant period, are subjected to lifelong immunosuppressive therapy. The use of immunosuppressive drugs, such as calcineurin inhibitors (CNI), is associated with a higher risk of developing skin cancers, including melanoma and non-melanoma skin cancers (NMSC). However, no large-scale studies have yet been conducted on the incidence of these cancers among organ recipients in Poland. The main aim of this study was to analyze the incidence of melanoma (CM) and NMSC in patients after kidney, liver, or heart transplantation in Poland and to assess the impact of immunosuppression on the development of these cancers.

Material and Methods: The study combined the results of a systematic review of international literature and a meta-analysis (including data on a total of 309,551 patients), concerning the risk of NMSC and melanoma in kidney transplant recipients treated with CNI. Analyses for the Polish population were based on data obtained from the National Health Fund (NFZ) and the National Cancer Registry (KRN) on the incidence of skin cancers in kidney, liver, and heart transplant recipients between 2010 and 2022. In total, data on more than 17,000 patients were included in the analyses and compared with data from the general Polish population.

Results: The systematic review demonstrated a correlation between CNI use in kidney transplant patients and an increased overall risk of skin cancers (OR 1.28; 95% CI: 0.10–16.28; $p < 0.01$), risk of melanoma (OR 1.09; 95% CI: 0.25–4.74; $p < 0.01$), and risk of NMSC (OR 1.16; 95% CI: 0.41–3.26; $p < 0.01$). Data on the Polish population came from studies involving more than 17,000 kidney, liver, and heart transplant recipients. Compared with the general population, kidney recipients had a higher risk of melanoma after 1 year (0.02% vs 0.01%, $p < 0.001$), after 5 years (0.17% vs 0.05%, $p < 0.001$), and after 10 years (0.36% vs 0.1%, $p < 0.001$). In liver transplant recipients, the risk of melanoma was 0.03% vs 0.01% after 1 year ($p < 0.001$), 0.20% vs 0.05% after 5 years ($p < 0.001$), and 0.20% vs 0.1% after 10 years ($p <$

0.001). Similarly, in heart transplant recipients, the risk of melanoma was higher both after 1 year (0.02% vs 0.01%, $p < 0.001$), after 5 years (0.16% vs 0.05%, $p < 0.001$), and after 10 years (0.16% vs 0.1%, $p < 0.001$). In kidney recipients, the risk of NMSC was 0.09% vs 0.04% after 1 year ($p < 0.001$), 1.21% vs 0.18% after 5 years ($p < 0.001$), and 4.18% vs 0.36% after 10 years ($p < 0.001$). In liver recipients, the risk was 0.09% vs 0.04% after 1 year ($p < 0.001$), 0.83% vs 0.18% after 5 years ($p < 0.001$), and 2.65% vs 0.36% after 10 years ($p < 0.001$). In heart recipients, the risk of NMSC was also higher compared with the general population: after 5 years (0.89% vs 0.18%, $p < 0.001$) and after 10 years (4.06% vs 0.36%, $p < 0.001$).

Main Conclusion:

In Poland, patients after solid organ transplantation (kidney, liver, heart) undergoing chronic immunosuppression show an increased incidence of melanoma and NMSC compared with the general population. These results confirm the need for targeted preventive and monitoring measures for skin cancers in this patient group.

Detailed Conclusions:

1. The meta-analysis of global medical literature showed that calcineurin inhibitors (cyclosporine A, tacrolimus) significantly increase the risk of melanoma and NMSC in transplant recipients compared with patients treated with other immunosuppressive agents, highlighting the need to consider oncological risk when selecting immunosuppressive therapy.
2. Analysis of NFZ and KRN data enabled, for the first time, a large-scale assessment of the actual incidence of melanoma in Polish solid organ transplant recipients, confirming a clearly increased cancer risk in this group. The data indicate that in kidney, liver, and heart recipients, the risk of melanoma is twice as high after 1 year, 4 times higher after 5 years, and nearly 9 times higher after 10 years compared with the general Polish population in the same periods.
3. Analysis of NFZ and KRN data also showed that kidney, liver, and heart recipients face a risk of NMSC that is twice as high after 1 year, 4.5 times higher after 5 years, and up to 9 times higher after 10 years compared with the general Polish population in the same periods.
4. It is recommended to establish integrated preventive programs, including systematic dermatological examination for kidney, liver, and heart transplant recipients, as well as educational initiatives aimed at patients and medical staff on sun protection and self-examination of the skin.