

# Skin Cancer Development in Pediatric Patients Following Solid Organ Transplant

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## INTRODUCTION

- The period following a solid organ transplant (SOT) is a vulnerable time for the recipient's immune system, as transplant patients require immunosuppressive agents to prevent tissue rejection.
- With the advent of novel immunosuppressive regimens, transplant recipients are surviving longer, avoiding deaths attributable to organ rejection, and thus encountering more chronic sequelae of their immunosuppressed state.
- Patients are at an increased risk for malignancies, with skin keratinocyte carcinomas (KC) being the most common malignancy reported in adults.
- There is extensive literature regarding the association of KC development in adult SOT patients. KC is associated with higher morbidity and 30- to 52-fold higher mortality rates in the adult transplant population.
- However, as in many other medical conditions, pediatric patients have the potential to display a vastly different response than adults following SOT. There is a paucity of data describing the risk of KC in pediatric transplant recipients and thus little guidance on risk stratification for this population.
- This study aims to expand the existing knowledge of skin cancer incidence following pediatric SOT.

## METHOD

- After IRB exemption, a retrospective chart review was performed on all SOT patients seen by dermatology at MUSC from 1/1/13, to 6/1/22.
- Baseline demographics, transplant type and date, as well as all relevant co-morbid conditions, smoking status, pre-transplant skin cancer history, family history of skin cancer, post-transplant medications and post-transplant complications were recorded.
- Presence of skin cancer diagnosis was assessed, and if applicable, type, number, grade, and location of post-transplant skin cancer(s) was recorded.
- Data analysis was performed using SPSS Statistics. Data was filtered by age at transplant of  $\leq 18$  years and descriptive statistics were utilized to characterize the study population.

## RESULTS

- We identified a total of 540 patients who underwent SOT and had been seen by dermatology.
- Of these, 38 patients were 18 years of age or younger at time of transplant, with 47.4% being female and 52.6% male.
- Racial composition was 57.9% Caucasian/White, 31.6% African American/Black, and 10.5% "other" races, which encompassed American Indian or Alaska Native, Asian, Hispanic or Latino, and Pacific Islander.
- Most pediatric transplant patients had a kidney transplant alone (42.1%) or in combination with liver (7.9%) or pancreas (2.6%), followed by liver transplant (23.7%) and heart transplant (23.7%).
- Skin cancer was diagnosed post-transplant in **2 of these 38 pediatric patients (5.3%)**, both of whom were Caucasian/White. One had a kidney transplant, and the other a simultaneous kidney-pancreas transplant (Table 1).
- Mean current age for those without a skin cancer diagnosis in the post-transplant period was **20.4 years** compared to a mean current age for those diagnosed with skin cancer of **54.5 years**. Average age at transplant among pediatric patients who developed skin cancer was **12.5 years**, while the average for pediatric transplant recipients who did not subsequently develop skin cancer was **8.05 years**.
- The average number of years since transplant at time of chart review was **13.9 years** for all pediatric SOTs, **42.0 years** for the pediatric solid organ transplant recipients (SOTs) who developed post-transplant skin cancer, and **12.4 years** for those who did not.
- The mean duration of post-transplant immunosuppressive medications at time of first skin cancer was **15.5 years** for the two pediatric transplant patients diagnosed with skin cancer, compared to **5.1 years** for all adult patients diagnosed with skin cancer in this post-transplant period.
- Both pediatric transplant patients with post-transplant skin cancer identified as never smokers, and neither reported a family history of skin cancer.

Table 1: Pediatric Solid Organ Transplant Recipient Demographics

	All Pediatric Transplant Recipients	Pediatric Transplant Recipients without Skin Cancer	Pediatric Transplant Recipients with Skin Cancer
Mean age at transplant (years)	8.3	8.05	12.5
Type of transplant			
Kidney	16 (42.1%)	15 (41.7%)	1 (50.0%)
Kidney - Liver	3 (7.9%)	3 (8.3%)	0 (0.0%)
Kidney - Pancreas	1 (2.6%)	0 (0.0%)	1 (50.0%)
Liver	9 (23.7%)	9 (25.0%)	0 (0.0%)
Heart	9 (23.7%)	9 (25.0%)	0 (0.0%)
Race			
Caucasian	22 (57.9%)	20 (55.6%)	2 (100%)
African American	12 (31.6%)	12 (33.3%)	0 (0.0%)
Other	4 (10.5%)	4 (11.1%)	0 (0.0%)
Sex			
Female	18 (47.4%)	17 (47.2%)	1 (50%)
Male	20 (52.6%)	19 (52.8%)	1 (50%)
Smoking Status			
Never smoker	34 (89.5%)	32 (88.9%)	2 (100%)
Current smoker	0 (0.0%)	0 (0.0%)	0 (0.0%)
Former smoker	4 (10.5%)	4 (11.1%)	0 (0.0%)

## DISCUSSION

- It is well known that adult SOTs are at increased risk of developing skin cancer as compared to the non-transplant population. Review of five major studies revealed that KC is the second most common post-transplant malignancy in the pediatric population, just behind Post-Transplant Lymphoproliferative Disorder.
- It has been estimated that approximately 14% of all SOTs will develop skin cancer within the 10-year period following transplant.
- In our cohort of 38 pediatric transplant recipients, however, only 2 went on to receive a diagnosis of skin cancer, despite an average of 13.9 years between age at transplant and current age at time of chart review.
- It has been posited that the occurrence of skin cancer in transplanted children rarely happens in childhood because of the critical nature of aging for the development of such cancers.
- No official guidelines exist for skin cancer surveillance screening post-transplant in this population. Our results, and others', suggest it may be reasonable to delay referral for skin cancer screening until early adulthood. However, education on preventative measures such as avoidance of sunlight exposure and use of sun-protective clothing is extremely important in this vulnerable population.
- Our study is limited by small sample size. The number of pediatric SOTs was small, and the number of patients within this group that subsequently developed skin cancer was even smaller.
- Our study aimed to contribute to the available literature pertaining to the incidence of KC amongst pediatric SOTs to better define the risk in this population. However, larger studies are needed to determine the appropriate time to refer pediatric SOT patients for skin cancer screenings.

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