

Skin Manifestations Following Liver Transplantation: A Cross-Sectional Study of 100 Iranian Recipients

Zahra Saffarian^{1,2}, Azin Pakmehr³, Ali Dehghani⁴, Mohsen Nasiri-toosi^{4,5}, Hassan Vahidnezhad^{6*}

¹ Department of Dermatology, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran.

² Autoimmune Bullous Diseases Research Center, Razi Hospital, Tehran University of Medical Sciences, Tehran, Iran.

³ Endocrinology and Metabolism Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.

⁴ Liver Transplantation Center, Tehran University of Medical Sciences, Tehran, Iran.

⁵ Division of Gastroenterology and Hepatology, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran.

⁶ Department of Pediatrics of the Perelman School of Medicine, and the Division of Human Genetics at the Children's Hospital of Philadelphia, Philadelphia, United States of America.

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* Corresponding Author:

Hassan Vahidnezhad;
MSc, PhD, Research Associate
Professor of Pediatrics and Human
Genetics in the Department of
Pediatrics of the Perelman School of
Medicine, and the Division of Human
Genetics at the Children's Hospital of
Philadelphia, Philadelphia, United
States of America

Email:

hassan.vahidnezhad1981@gmail.com

ABSTRACT

The increased survival of transplant patients, as a result of several advancements in this field, has led to new challenges, including cutaneous diseases, which have an impact on both the quality and quantity of life. This longer-living transplant population has begun to develop dermatological complications, some of which including cutaneous malignancies result in an increase in mortality, and others in a decline in quality of life. This study includes 100 recipients who attended the Imam Khomeini Hospital's liver transplant clinic for their routine follow-up and were referred to the skin clinic for a dermatologic examination in order to determine the occurrence of skin manifestations Post liver transplantation. At the time of the visit, 85 of the 100 patients had at least one skin problem, including 85 dermatologic diseases with xerosis as the most common, 41 benign skin lesions (the most common of which was melanocytic nevus), 20 infectious disorders (with 6 warts), 5 malignant lesions (with Four basal cell carcinomas and One squamous cell carcinoma), 4 mucosal candidiasis, 1 aphthous lesion, and various nail manifestations. This study demonstrates that liver transplantation requires lower immunosuppression than other solid organ transplants, but skin manifestations are more frequent than in the general population; therefore, skin care must be part of the clinical approach for these patients.

Keywords: Cutaneous Malignancy; Immunosuppression; Liver Transplantation; Skin Manifestations; Transplant

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Introduction

Liver diseases are a global public health issue that is particularly frequent in Asian countries, accounting for 62.6% of global deaths [1]. For a range of irreversible acute and chronic liver diseases, liver transplantation (LT) is the treatment of choice [2]. The results of liver transplantation have improved due to advances in perioperative technique, a better understanding of the course and prognosis of several liver diseases, improved immunosuppressive therapy, and more effective postoperative care [2]. Due to the considerable advances that have been achieved in LT, this procedure has become routine with an excellent outcome in terms of both quality and length of survival [3]. Approximately 50,000 people are living with a donor liver today, with 90–95% and 70% survival rates at one year and five years post-transplantation, respectively [4]. In parallel with the rapid ongoing trend toward liver transplantation, we are confronted with secondary challenges linked to complications following LT [2]. One of the most frequent challenges facing the liver transplant community is dermatologic complications, emerging both in the early and long-term follow-up periods [2]. Studies indicate that the high prevalence of dermatologic problems in patients undergoing liver transplantation is mainly because of the long-term use of immunosuppressant drugs [2,4,5-7]. Furthermore, the past history of treated skin cancer and the graft itself may play another role in the exhibition of cutaneous problems [8,9]. The dermatological problems in LT patients range from benign to malignant lesions, some of which lead to increased mortality and others to a decline in quality of life. Therefore, every patient with LT should be provided with post-transplant dermatological care and should be advised to visit a dermatologist for any suspicious dermatological problems [5,10].

In the Iranian population, about 8,000 deaths per year are due to chronic liver diseases, and cryptogenic cirrhosis is the leading cause of end-stage liver disease [11]. Despite the increasing rate of liver transplantation [5], and what has been achieved since the first liver transplantation in Iran in 1993, there is still insufficient information about dermatologic complications after liver transplantation. In this study, we aimed to investigate the dermatologic manifestations Post liver transplantation in the Iranian population.

Methods and Materials

This cross-sectional study was carried out on 100 adult LT recipients attending the liver transplantation clinic of Imam Khomeini Hospital, Tehran, Iran, between 2019

and 2020 for their follow-up project. A skin examination, including the face and the whole body, was conducted by dermatologists. The involved patients were informed of the purpose of the study and provided written informed consent to participate in it. If there were skin lesions at the time of the visit, they were recorded, and when the lesions were suspected to be malignant or we could not make a definite diagnosis by skin examination, the patient was referred to the dermatology operating room for skin biopsy, and the pathology report was recorded in the questionnaire. The questionnaire contained data about demographic information including sex, age at the time of visit, skin color (measured on the Fitzpatrick scale – 1,2,3 as light and 4,5,6 as dark), family history of similar skin diseases, and sun exposure rate. Information regarding LT, including underlying medical conditions of the transplant agent, time interval between transplantation and the first mucocutaneous lesion, medications received by the patient, and information related to skin examination, including a complete examination of skin, mucous membranes, nails, and hair, was collected. The skin lesions that were diagnosed were categorized into dermatologic diseases, benign tumors, malignant tumors, nail involvement, mucosal manifestations, and infectious lesions.

Data were analyzed using SPSS. Categorical variables were analyzed using the chi-square test, while continuous variables were compared using the independent samples t-test. A p-value <0.05 was considered statistically significant.

Result

A total of 100 liver transplant recipients were investigated (Table 1). The population consisted of 65 (65%) males and 35 (35%) females. The mean age of patients in this study was 48.31 ± 12.49 years. The average time since transplantation was 4.73 ± 2.18 years. The reasons for liver failure were numerous. The most common causes of liver transplantation in patients were idiopathic (26 patients, 26%), primary sclerosing cholangitis in 12 patients (12%), autoimmune disorders, and hepatitis B virus infection in 10 patients (10%), respectively. 49 patients in this study (49%) had light skin color and 51 patients (51%) had dark skin color. The mean duration of sun exposure in patients was 1.11 ± 0.77 hours per day.

A total of 85 patients (85%) had at least one dermatologic manifestation during the follow-up period, with the findings summarized in Table 2. Xerosis was the most commonly seen (18%) phenotype among patients. Other types of dermatologic diseases include lentigo,

Table 1. Demographic data of liver transplant recipients.

Characteristics	No (%)
Patient	100
Ethnicity	-
Iranian	100
Sex	-
Male	65
Female	35
Mean age	48.31 ± 12.49
Skin color	-
Dark skin	51
Light skin	49
Etiology of liver transplantation	-
Alcoholic	2
Nonalcoholic steatohepatitis (NASH)	3
Autoimmune	10
Congenital	4
Hepatic steatosis	6
Budd-Chiari Syndrome	6
Idiopathic	26
Hemochromatosis	2
Wilson's disease	3
Drug-related	1
Hepatitis B	10
Hepatitis C	10
Hepatocellular carcinoma	2
Primary sclerosing cholangitis	12
Herbal therapy	2
Tyrosinemia	1
Immunosuppression	-
Tacrolimus	77
Mycophenolate mofetil	62
Prednisolone	51
Mesalazine	6

alopecia areata, telogen effluvium, acne, dermatitis, tinea versicolor, androgenic alopecia, Melasma, Photosensitivity rash, psoriasis, lichen planopilaris, and pigmented pruritic dermatosis. Nail problems were the second most prevalent phenotype, widely seen in 42% of the patients. Multiple nail changes were found in our patients, including ridging, leukonychia, onychochizia, Beau's line, subungual hyperkeratosis, onychomycosis, and Koilonychia. However, these manifestations may not be specific to liver transplant patients. The most frequent benign lesion identified in our patients was melanocytic nevus (15%; n = 15), and in total, forty-one (41%) patients had benign skin lesions, including cherry angioma, seborrheic wart, adnexal tumor, skin tag, lipoma, epidermal cyst, and Xanthoma. The next most common cause was skin infection, which accounted for 20% of the cases. Viral warts were the most prevalent skin infection (6%; n = 6). The time since transplantation did not appear to affect the development

Table 2. Dermatologic diagnosis during follow-up.

Dermatologic finding	No. of patient (%)
Dermatologic diseases	(85)
Xerosis	18
Lentigo	14
alopecia areata	9
telogen effluvium	9
Acne	8
Dermatitis	6
Tinea versicolor	5
Androgenic alopecia	5
Melisma	4
photosensitivity rash	2
Psoriasis	2
lichen planopilaris	2
pigmented pruritic dermatosis	1
Nail problems	(42)
Ridging	15
Leukonychia	12
Onychoschizia	6
Beau's line	3
Subungual hyperkeratosis	2
Onychomycosis	2
Koilonychias	2
Benign lesions	(41)
melanocytic nevus	15
cherry angioma	10
seborrheic wart	5
adnexal tumor	4
skin tag	3
Lipoma	2
epidermal cyst	1
Xanthoma	1
Infection	(20)
Wart	6
tinea versicolor	5
Candida	4
Onychomycosis	2
Paronychia	2
Dermatophyte	1
Cutaneous malignancies	(5)
Basal cell carcinoma	4
Squamous cell carcinomas	1

of warts. The mean duration from the transplant to the diagnosis of warts was 4.73 ± 2.1 years (Fig. 1). The development of viral warts was statistically linked to an immunosuppressive treatment that included tacrolimus and mycophenolate mofetil. Other skin infections seen included fungal infections like tinea versicolor, candida, onychomycosis, paronychia, and dermatophytosis.

Five (5%) cases of cutaneous malignancies were seen in our study, all male. There were four basal cell carcinomas (BCC) and one squamous cell carcinoma (SCC). All of the patients had single tumors.

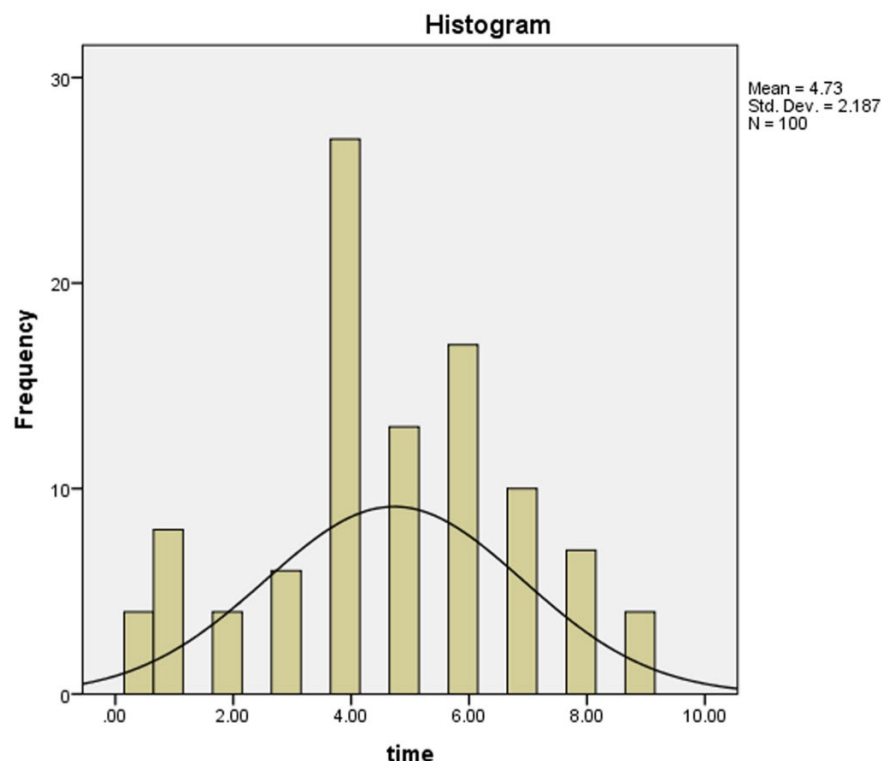


Fig. 1. Distribution of the years passed from transplantation

Immunosuppressive regimens

The liver transplant team monitored all patients and modified immunosuppression as needed. Primary induction immunosuppression consisted of tacrolimus, mycophenolate mofetil, and prednisolone. Mycophenolate mofetil and prednisolone were reduced over time and withdrawn where possible. Patients were subsequently maintained on tacrolimus or mycophenolate mofetil monotherapy unless concomitant immunosuppression was required.

Discussion

According to different studies, skin problems in patients undergoing liver transplantation are higher in incidence compared to the general population as a result of long-term immunosuppressive medication use [2,4,8,12]. There are a variety of skin complications after LT, but in the setting of immunosuppression, some of these complications tend to be more violent and can sometimes be lethal [13]. In Iran, the number of patients undergoing LT is about 800 annually, but there is still a long way to go to achieve adequate information about complications following the procedure [14].

In our study, 85 of 100 patients developed at least one cutaneous manifestation. In the case of cancer, the overall incidence of skin cancer Post liver transplantation was 5% at 4.7 years after transplantation. Only 5 malignancies

with a ratio of 4: 1 BCC to SCC were recorded in our study. Such a low incidence rate is comparable to the pooled incidence rates of numerous studies, demonstrating that skin cancers are less common in liver transplant recipients than in other solid organ transplant recipients, but more common than in the general population [6,15-21]. Moreover, cutaneous malignancies observed in Belloni-fortina *et al.* and Mithoefer *et al.* studies indicated a BCC: SCC ratio of 6: 6 and 23: 23 out of 161 and 151 LT patients, respectively [5,6]. Interestingly, tacrolimus was the most widely used immunosuppressive agent in our and Perera *et al.* studies with almost the same BCC: SCC ratio as our report, but most of the LT patients in the Belloni-fortina *et al.* and Mithoefer *et al.* studies were under the cyclosporine-based immunosuppressive regimen, suggesting the possible role for cyclosporine in developing SCC after LT [5,17]. Numerous risk factors seem to be associated with skin malignancies after liver transplantation. Among them, age and the time between LT and dermatologic examination, which reflect the duration of immunosuppression, play a key role in skin complications [5,17,20], which were significantly lower in our study. Other established risk factors are frequent sunlight exposure, skin type, and infection with human papillary virus, which are considered protective factors in our study due to darker skin type, lower sun exposure, and a lower rate of human Papillomavirus virus infection [5,11].

Among 100 patients in our study, 20 infectious manifestations were recorded, including 6 viral warts and 5 tinea infections, which is lower in comparison with some studies in our literature review and may be explained by the higher percentage of our patients on dual and monotherapy [6,17,21]. Due to immunosuppression, treatment of infections in transplant recipients has always been challenging, but owing to the peculiar attributes of the liver, a less aggressive immunosuppressive regimen is necessary for LT recipients in comparison to other solid organ transplantations, resulting in a lower infection prevalence in LT patients [22]. In our study, viral warts were the most frequent cutaneous infection, which is consistent with previous findings [6,8]. Not only are such warts common in organ transplant patients, but they also have a limited potential for spontaneous regression and can be resistant to treatment. Immediate action is essential as they can negatively influence the quality of life if they persist or recur [22].

In the present study, 41 benign skin tumors were found, which was consistent with the studies in our literature review. According to them, the use of immunosuppressive drugs seems to be the main culprit [3,11]. The lack of valid information about pre-transplant skin disorders is considered a limitation in our study. Also, we recorded the manifestations that existed at the time of our visit, not the ones that had been cured or vanished. The mean time between the liver transplantation and our visit was about 4 years, but studies show that the prevalence of malignancies increases as time passes, especially after 10 years.

In conclusion, the prevalence of skin disorders following LT was not uncommon, and liver recipients are at higher risk of cutaneous diseases in comparison with the general population. Early diagnosis of these complications results in more efficient treatment and also notifies transplant clinicians to adjust immunosuppressive medication. This study suggests that dermatologic examination must be a part of the multidisciplinary clinical follow-up of liver recipients.

References

- [1] Sarin SK, Kumar M, Eslam M, George J, Al Mahtab M, Akbar SMF, et al. Liver diseases in the Asia-Pacific region: a Lancet Gastroenterology & Hepatology Commission. *Lancet Gastroenterol Hepatol*. 2020 Feb;5(2):167-228. [https://doi.org/10.1016/S2468-1253\(19\)30342-5](https://doi.org/10.1016/S2468-1253(19)30342-5)
- [2] Kim JM, Kim DG, Kim J, Lee K, Lee KW, Ryu JH, et al. Outcomes after liver transplantation in Korea: Incidence and risk factors from Korean transplantation registry. *Clin Mol Hepatol*. 2021 Jul;27(3):451-62. <https://doi.org/10.3350/cmh.2020.0292>
- [3] Puigvehí M, Hashim D, Haber PK, Dinani A, Schiano TD, Asgharpour A, et al. Liver transplant for hepatocellular carcinoma in the United States: Evolving trends over the last three decades. *Am J Transplant*. 2020 Jan;20(1):220-30. <https://doi.org/10.1111/ajt.15576>
- [4] Schmied E, Dufour JF, Euvrard S. Nontumoral dermatologic problems after liver transplantation. *Liver Transpl*. 2004 Mar;10(3):331-9. <https://doi.org/10.1002/lt.20089>
- [5] Mithoefer AB, Supran S, Freeman RB. Risk factors associated with the development of skin cancer after liver transplantation. *Liver Transpl*. 2002 Oct;8(10):939-44. <https://doi.org/10.1053/jlts.2002.35551>
- [6] Belloni-Fortina A, Piaserico S, Bordignon M, Gambato M, Senzolo M, Russo FP, et al. Skin cancer and other cutaneous disorders in liver transplant recipients. *Acta Derm Venereol*. 2012 Jul;92(4):411-5. <https://doi.org/10.2340/00015555-1316>
- [7] Otley CC, Pittelkow MR. Skin cancer in liver transplant recipients. *Liver Transpl*. 2000 May;6(3):253-62. <https://doi.org/10.1053/lv.2000.6352>
- [8] Sarac G, Ozcan KN, Baskiran A, Cenk H, Sarac M, Sener S, et al. Dermatological signs in liver transplant recipients. *J Cosmet Dermatol*. 2021 Sep;20(9):2969-74. <https://doi.org/10.1111/jocd.13944>
- [9] Yadav DK, Bai XL, Liang T. Dermatological Disorders following Liver Transplantation: An Update. *Can J Gastroenterol Hepatol*. 2019 Apr 1;2019:9780952. <https://doi.org/10.1155/2019/9780952>
- [10] Reggiani M, Pauluzzi P, Bellusci R, De Raffe E, Nardo B, Gozzetti G. [Dermatologic problems in patients undergoing liver transplantation]. *G Ital Dermatol Venereol*. 1989;124(9):393-396.
- [11] Saidi RF, Kazemaini SM, Malekzadeh R. Current Challenges of Liver Transplantation in Iran. *Middle East J Dig Dis*. 2018 Jan;10(1):45-9. <https://doi.org/10.15171/mejdd.2017.90>
- [12] Schaefer I, Rustenbach SJ, Zimmer L, Augustin M. Prevalence of skin diseases in a cohort of 48,665 employees in Germany. *Dermatology*. 2008;217(2):169-72. <https://doi.org/10.1159/000136656>
- [13] Burton KA, Ashack KA, Khachemoune A. Cutaneous Squamous Cell Carcinoma: A Review of High-Risk and Metastatic Disease. *Am J Clin Dermatol*. 2016 Oct;17(5):491-508. <https://doi.org/10.1007/s40257-016-0207-3>
- [14] Malek-Hosseini SA, Jafarian A, Nikeghbalian S, Poustchi H, Lankarani KB, Nasiri Toosi M, et al. Liver Transplantation Status in Iran: A Multi-center Report on the Main Transplant Indicators and Survival Rates. *Arch Iran Med*. 2018 Jul 1;21(7):275-82.
- [15] Howard MD, Su JC, Chong AH. Skin Cancer Following Solid Organ Transplantation: A Review of Risk Factors and Models of Care. *Am J Clin Dermatol*. 2018 Aug;19(4):585-97. <https://doi.org/10.1007/s40257-018-0355-8>
- [16] Cohen BE, Krivitskiy I, Bui S, Forrester K, Kahn J, Barbers R, et al. Comparison of Skin Cancer Incidence in Caucasian and Non-Caucasian Liver Vs. Lung Transplant Recipients: A Tale of Two Regimens. *Clin Drug Investig*. 2019 Feb;39(2):197-203. <https://doi.org/10.1007/s40261-018-0732-3>
- [17] Perera GK, Child FJ, Heaton N, O'Grady J, Higgins EM. Skin lesions in adult liver transplant recipients: a study of 100 consecutive patients. *Br J Dermatol*. 2006 May;154(5):868-72. <https://doi.org/10.1111/j.1365-2133.2006.07154.x>
- [18] Ghosh K, Capell BC. The Senescence-Associated Secretory

- Phenotype: Critical Effector in Skin Cancer and Aging. *J Invest Dermatol.* 2016 Nov;136(11):33-9. <https://doi.org/10.1016/j.jid.2016.06.621>
- [19] Ashraf T, Nimri F, Gill S, Jafri SM. S1061 Skin Cancer Screening and Incidence in African Americans Following Liver Transplantation. *Off J Am Coll Gastroenterol.* 2020;115:S538. <https://doi.org/10.14309/01.ajg.0000706292.83932.96>
- [20] ShengYang Lian B, Lee Krishnamoorthy T, Oh CC. Skin conditions in liver transplant recipients in a Singapore academic medical center: A retrospective cohort study. *JAAD Int.* 2021 Jul 31;4:70-78. <https://doi.org/10.1016/j.jdin.2021.06.002>
- [21] Moini M, Schilsky ML, Tichy EM. Review on immunosuppression in liver transplantation. *World J Hepatol.* 2015 Jun 8;7(10):1355-68. <https://doi.org/10.4254/wjh.v7.i10.1355>
- [22] Leow MQH, Oon HHB. The impact of viral warts on the quality of life of patients. *Dermatol Nurs.* 2016;15(4):44-48.