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Original Article

Effects on quality of life and psychosocial wellbeing in Chinese patients with keloids

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Abstract: Keloids are defined as raised scar tissue that grows excessively and invasively beyond the original wound borders during abnormal, fibroproliferative wound healing. The effects of these lesions on quality of life (QoL) and psychosocial wellbeing have not been assessed in keloid-endemic environments such as China. The purpose of our study was to investigate the QoL and mental health status of patients with keloids in China. The Dermatology Life Quality Index (DLQI) questionnaire and the Symptom Checklist-90 (SCL-90) were used to explore the effects of keloids on patients' QoL and psychosocial wellbeing. The main scoring elements of the DLQI focused on psychological feelings, QoL, and social activities. In addition, the results of the SCL-90 revealed that scores pertaining to interpersonal relationship sensitivity, depression, and anxiety were higher in the visible scar group than in either the invisible scar group or the normal group ($P < 0.05$). The depression and anxiety scores in the invisible scar group were higher than those in the normal group ($P < 0.05$), but there were no statistically significant differences in other indices between the invisible scar group and the normal group ($P < 0.05$). The mental health of female patients was affected to a greater extent than in male patients ($P < 0.05$). Our findings suggest that psychological and clinical interventions would be beneficial for patients with keloids to improve their QoL.

Keywords: Keloids, psychosocial wellbeing, dermatology life quality index, symptom checklist 90

Introduction

Keloids are locally aggressive, benign fibroproliferative scars (**Figure 1**). Keloids usually form after a traumatic event as a result of altered wound healing, with excessive scar tissue formation that extends beyond the area of the initial wound and does not regress spontaneously [1]. However, the primary mechanism responsible for keloid formation is still poorly understood [2-4]. Although keloids are more common in patients with dark skin than in those with light skin, the epidemiology of keloids is generally variable. The reported incidence of keloids in the general population ranges from 16% among adults in Zaire to 0.09% in England [5, 6]. Keloids remain one of the most challenging dermatologic conditions to successfully treat and may have significant psychosocial effects on patients. Although people of all ages can suffer from keloids, affected patients are often young and healthy [7]. In addition to pain and functional disability, the appearance of keloids can cause psychosocial distress because they are typically perceived as aesthetically undesirable [8-10]. Therefore, keloids may negatively impact a patient's quality of life (QoL).

Surprisingly, little is known about the psychosocial effects on patients with keloids in China. The effects of other skin diseases have been extensively researched, but keloids have been largely neglected [11, 12]. The reason for this may be because the importance of a patient's appearance is generally underestimated by medical professionals. The Symptom Checklist-90 (SCL-90) is a 90-item, self-reported symptom inventory developed in the United States that was designed to assess psychological symptom patterns and levels of distress in communities [13]. In this study, the psychosocial effects on Chinese patients with keloids were investigated using the Dermatology Life Quality Index (DLQI) questionnaire and the SCL-90.

Figure 1. Clinical features of keloids.

Effects of keloids on the QoL and psychosocial wellbeing of patients were evaluated to predict the success of clinical and psychological interventions used in such patients.

Materials and methods

Questionnaire

DLQI questionnaire and the SCL-90 were adopted for the survey. The medical staff presented the content of the questionnaire to the patients prior to the actual survey, and patients anonymously completed the questionnaires by themselves. Any patient who had difficulty filling out the questionnaire was assisted by the medical staff. General information was collected (e.g., current age and gender, ethnicity, clinical characteristics, family history, duration of keloids). The questionnaires were completed between October 2016 and October 2020, and analyses were then performed to compare the visible scar, invisible scar, and normal groups. Ultimately, 553 questionnaires without missing data were analyzed. The hospital ethics committee approved the study protocol. Written consent was obtained from all participating patients.

Definitions

Questionnaire (http://www.dermatology.org.uk/) was designed by Finlayin 1994, it was a self-administered, easy and user-friendly questionnaire, has been validated for dermatology patients aged 16 years and above. The DLQI questionnaire consisted of 10 questions concerning the patient's perception of the impact of keloids on different aspects of their QoL over the last week. The questions focused on symptomology, feelings, daily activities, clothing, leisure activities, participation in sports, work and school activities, relationships, sexual difficulties, and treatments, covering six dimensions (symptomology and feelings; daily activities, including clothing; leisure activities, including participation in sports; work and school activities; personal relationships, including sexual difficulties; and treatment). Each item is scored on a four-point scale: 0, not at all/not relevant; 1, a little; 2, a lot; and 3, very much. Scores of individual items (0-3) are added to yield a total score (0-30); higher scores mean greater impairment of the patient's QoL. DLQI bands are as follows: 0-1 = No effect, 2-5 = Small effect, 6-10 = Moderate effect, 11-20 = Very large effect, 21-30 = Extremely large effect.

SCL-90 scores were calculated by dividing the symptoms into five grades: (1) symptom-free: 0 points; (2) mild symptoms: 1 point; (3) moderate symptoms: 2 points; (4) mildly severe symptoms: 3 points; (5) severe symptoms: 4 points. Thus, higher scores represented worse psychological states.

Statistical analysis

Questionnaire results were entered into a database created using Epi Info, version 6.0 (U.S. Centers for Disease Control and Prevention, Atlanta, GA) and converted into the proper format for analysis using SPSS, version 15.0 statistical software, *P* values less than 0.05 were considered statistically significant. Measure-

Table 1. Age groups of the keloid patients

Age	Number of patients	Percentage
> 18	157	28.39
20-29	254	45.93
30-39	78	14.10
40-49	35	6.33
50-60	18	3.26
> 60	11	1.99
Total	553	100

Table 2. Length of time since keloid developed

Period	Number of subjects	Percentage
Less than 1 year	65	11.75
1-2 years	103	18.63
2-10 years	337	60.94
Since childhood	48	8.68
Total	715	100

ment data does not accord with normal distribution, which was expressed by median and interquartile range (IQR), and it was studied by means of single factor analysis using rank test, the life quality of keloids patients was studied by multi-factor non-conditional Logistic regression analysis. For the stratified analysis, differences between the groups in terms of the factor were tested using the Chi Squared test.

Results

General patient demographics

Among the 553 patients with keloids, there were 260 males and 293 females, resulting in a male: female ratio of 1:1.13. The age of keloid onset ranged from 18 to 79 years (**Table 1**). The majority (385, 69.62%) of patients had lesions for more than two years, whereas 48 (8.68%) patients had lesions since childhood (**Table 2**). Of the total patient population, 383 (69.26%) had been undergoing treatment for at least one year, 143 (25.86%) patients had been undergoing treatment for less than one year, and 27 (4.88%) patients had never undergone treatment (**Table 3**).

DLQI scores

All patients completed the questionnaire after providing informed consent. The DLQI scores of

Table 3. Treatment period

Treatment period	Number of patients	Percentage
No treatment	27	4.88
Less than 1 year	143	25.86
1-2 years	86	15.55
2-10 years	260	47.02
Over ten years	37	6.69
Total	553	100

patients in the invisible scar group ranged from 2 to 16, whereas the scores of patients in the visible scar group ranged from 3 to 18. No patients had scores between 0 and 1, or between 21 and 30. The DLQI scores in patients with keloids were primarily distributed between 3 and 6 (50.29%) and between 6 and 10 (43.13%). psychological feelings, QoL, and social activities are the major scoring elements of DLQI in keloids patients (**Tables 4**, **5**).

Comparison of SCL-90 results among the three groups

The SCL-90 consisted of nine factors, with each factor reflecting a certain symptom experienced by the patients. Significant differences were found in the indices of the SCL-90 and positive scores among the three groups ($P < 0.01$). The scores pertaining to the interpersonal relationship sensitivity, depression, and anxiety indices were higher in the visible scar group than in the invisible scar and normal groups ($P < 0.05$). (**Tables 6**-**8**). The depression and anxiety scores in the invisible scar group were higher than those in the normal group ($P < 0.05$), but there were no statistically significant differences in the other indices between the invisible scar and normal groups ($P > 0.05$; **Table 6**). This survey also revealed that the mental health of female patients was affected to a greater extent than in male patients. The statistical analysis of the survey data is shown in **Table 9**.

Discussion

With changes in the use of disease modeling methods from biological to biological-psychological-social models, QoL and mental health issues have become important factors. Modern scientific research has also confirmed that psychological disorders are often closely related to disease states. The definition of “healthy” not only refers to the absence of disease but also

Table 4. The comparison between the group of visible scar group and invisible scar

DLQI Item	Visible scar group		Invisible scar		Mann-Whitney U value	*P* value
	Median	P_{25}-P_{75}	Median	P_{25}-P_{75}		
Q1	1	1,2	1	1,1	3.60×104	P < 0.01
Q2	2	1,2	1	1,2	3.80×104	P < 0.01
Q3	0	0,0	0	0,0	5.26×104	P > 0.05
Q4	1.5	1,2	1	1,2	1.50×104	P < 0.01
Q5	0	0,0	0	0,0	5.26×104	P > 0.05
Q6	0	0,0	0	0,0	5.26×104	P > 0.05
Q7	1	1,1	1	0,1	1.40×104	P < 0.01
Q8	0	0,1	0	0,1	1.75×104	P > 0.05
Q9	0	0,0	0	0,0	5.25×104	P > 0.05
Q10	0	0,1	0	0,1	4.80×104	P < 0.01
Total	7	6,9	5	5,8	1.29×104	P < 0.01

Q1-Q10 represent the 10 questions in the DLQI questionnaire, respectively. DLQI data of both groups does not accord with normal distribution, which was expressed by median.

Table 5. Multiple factors analysis of influencing factors correlated with DLQI score in keloids group

Independent variable		OR value	Std Error	*Wald* χ^2 test	*P* value	95% CI
body position	visible scar	6.23	0.35	25.10	< 0.01	3.05-12.70
	invisible scar	1.00				
Pruritus	Pruritus	3.32	0.35	11.31	< 0.01	1.60-6.40
	No Pruritus	1.00				
Size	> 25 cm^2	10.53	0.38	36.55	< 0.05	4.85-22.24
	5-25 cm^2	3.01	0.41	8.66	< 0.05	1.59-7.84
	≤ 5 cm^2	1.00				

Std Error: standard error, CI: confidence interval.

Table 6. Statistical data of SCL-90 after the survey between visible scar group and Normal group

Factor	visible scar group (χ ± SD)	Normal group (χ ± SD)	Differences between the groups
Total score	144.76±39.57	129.96±38.76	P < 0.01
Somatization	1.40±0.39	1.37±0.48	P > 0.05
Obsessive symptoms	1.67±0.51	1.62±0.58	P > 0.05
Interpersonal sensitivity	2.45±0.62	1.65±0.61	P < 0.01
Depression	2.33±0.52	1.50±0.59	P < 0.01
Anxiety	2.11±0.43	1.39±0.43	P < 0.01
Hostility	1.45±0.54	1.46±0.55	P > 0.05
Terror	1.22±0.32	1.23±0.41	P > 0.05
Paranoid ideation	1.49±0.47	1.43±0.57	P > 0.05
Psychotic diseases	1.33±0.39	1.29±0.42	P > 0.05

P < 0.01 showed that the two groups were of significant difference, while P < 0.05 illustrated that there existed difference between the two groups, whereas P > 0.05 explained no difference between the two groups.

the presence of a sound body and mind, and good social adaptability. Therefore, patients with somatic diseases should not be evaluated simply based on the disease itself but also on physiological, psychological, and social bases, which together results in a comprehensive health assessment [14]. A majority of the studies on the psychosocial impacts of keloids on patients have been conducted in Africa and Europe. However, current research on the

Table 7. Statistical data of SCL-90 after the survey between invisible scar group and Normal group

Factor	invisible group (χ ± SD)	Normal group (χ ± SD)	Differences between the groups
Total score	136.66±37.41	129.96±38.76	P < 0.01
Somatization	1.39±0.47	1.37±0.48	P > 0.05
Obsessive symptoms	1.64±0.62	1.62±0.58	P > 0.05
Interpersonal sensitivity	1.66±0.51	1.65±0.61	P > 0.05
Depression	1.89±0.34	1.50±0.59	P < 0.05
Anxiety	1.94±0.44	1.39±0.43	P < 0.01
Hostility	1.44±0.57	1.46±0.55	P > 0.05
Terror	1.23±0.35	1.23±0.41	P > 0.05
Paranoid ideation	1.47±0.44	1.43±0.57	P > 0.05
Psychotic diseases	1.32±0.53	1.29±0.42	P > 0.05

P < 0.01 showed that the two groups were of significant difference, while P < 0.05 illustrated that there existed difference between the two groups, whereas P > 0.05 explained no difference between the two groups.

Table 8. Statistical data of SCL-90 after the survey between visible scar group and invisible scar

Factor	visible scar group (χ ± SD)	invisible scar group (χ ± SD)	Differences between the groups
Total score	144.76±39.57	136.66±37.41	P < 0.05
Somatization	1.40±0.39	1.39±0.47	P > 0.05
Obsessive symptoms	1.67±0.51	1.64±0.62	P > 0.05
Interpersonal sensitivity	2.45±0.62	1.66±0.51	P < 0.01
Depression	2.33±0.52	1.89±0.34	P < 0.01
Anxiety	2.11±0.43	1.94±0.44	P < 0.05
Hostility	1.45±0.54	1.44±0.57	P > 0.05
Terror	1.22±0.32	1.23±0.35	P > 0.05
Paranoid ideation	1.49±0.47	1.47±0.44	P > 0.05
Psychotic diseases	1.33±0.39	1.32±0.53	P > 0.05

P < 0.01 showed that the two groups were of significant difference, while P < 0.05 illustrated that there existed difference between the two groups, whereas P > 0.05 explained no difference between the two groups and non-visible scar group.

Table 9. Statistical data of SCL-90 after the survey between different sex groups

Factor	Male group (χ ± SD)	Female group (χ ± SD)	Differences between the groups
Total score	143.75±38.27	144.12±35.68	P > 0.05
Somatization	1.39±0.47	1.41±0.42	P > 0.05
Obsessive symptoms	1.68±0.65	1.69±0.45	P > 0.05
Interpersonal sensitivity	2.44±0.68	2.45±0.49	P > 0.05
Depression	2.20±0.66	2.23±0.57	P > 0.05
Anxiety	2.15±0.55	2.25±0.35	P > 0.05
Hostility	1.44±0.55	1.46±0.42	P > 0.05
Terror	1.21±0.36	1.21±0.30	P > 0.05
Paranoid ideation	1.28±0.39	1.40±0.43	P < 0.05
Psychotic diseases	1.23±0.33	1.45±0.51	P < 0.05

P < 0.01 showed that the two groups were of significant difference, while P < 0.05 illustrated that there existed difference between the two groups, whereas P > 0.05 explained no difference between the two groups.

impact of keloids on a patient's psychological health has not been documented in China. Understanding the needs of a patient with keloids is an area of fundamental importance. The effects of keloids play major roles in a patient's psychological status and behavior

and can impact a patient's clinical treatment. Both DLQI questionnaire and the SCL-90 are widely accepted and scientifically rigorous. They have been validated in several large-scale investigations and were found to discriminate between levels of psychological distress as a function of a patient's medical condition or after a certain therapeutic intervention. Therefore, both DLQI and the SCL-90 can be used to assess the QoL of patients suffering from keloids.

The mental health status of patients with keloids is influenced by both disease factors and environmental/social factors. If a patient experiences interpersonal relationship sensitivity, depression, and anxiety for an extended duration, the nervous and immune system functions of the body are directly affected; thus, environmental/social factors appear to play important roles in the occurrence and development of keloids.

Overall, 278 patients had a total DLQI score of 3 to 6, 239 patients had a score of 6 to 10, and 36 patients had a score of 11 to 20. These findings suggest that keloids affect the QoL of all patients: a slight or moderate effect on most patients and a severe effect on a few patients.

The results of the SCL-90 revealed that there were patients with psychological problems in both the visible scar and invisible scar groups, similar to previous findings. Psychological problems were related to interpersonal relationship sensitivity, depression, and anxiety. The total SCL-90 scores for patients with keloids were higher than those of normal groups, which implies that the mental health status of patients in the visible scar and invisible scar groups is lower than that in the normal group. The presence of keloids can lead to such mental health issues as sensitivity to interpersonal problems caused by psychological and social factors. Thus, more attention should be paid to shifts from normal to abnormal psychological characteristics.

This survey also revealed that the mental health of female patients was affected to a greater extent than in male patients. Different mental health levels may be influenced by different biological and psychological characteristics in different groups. For example, the number of menstruating females was greater than that of males who have emissions. Therefore, in this case, females are more psychologically affected than males. It is likely, therefore, that biological and psychological sexual problems result in a poorer mental health status.

The results of this research also revealed that the majority of patients did not correctly identify the etiology of their keloids. The majority of patients in this study had lesions for 2-10 years, with some patients reporting the development of lesions during childhood. The mean duration of disease was 5.5 years, suggesting the chronic nature of these lesions. As keloids remain one of the most challenging dermatologic conditions to successfully treat, patients are often depressed due to feelings of helplessness. This is another important factor that influences a patient's QoL [15].

Some patients in this study complained that keloids affected their work and study activities [16]. Some patients reported itching, irritation, and other symptoms, such as physical dysfunction and restricted mobility from the formation of scar tissue in the joints. Such scar tissue formation can cause distress, seriously impacting not only a patient's QoL but also their work and study activities, giving rise to negative emotions [17].

The results of this study illustrate that patients with keloids in China have more psychological obstacles than normal persons, which requires psychological intervention. However, there are limitations in our study. The small sample size and the single-center and retrospective nature of the study were limitations. The results obtained in this study must be confirmed by additional studies conducted with larger cohorts that include follow-up assessments.

In summary, our results suggest that patients with keloids have significant social problems and challenges with their daily activities. Most patients with keloids in China experience negative psychosocial issues that are closely correlated to the occurrence and growth of their keloids. Psychological interventions should be performed as early as possible in the treatment regimens of these patients.

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Disclosure of conflict of interest

None.

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References

[1] Limandjaja GC, Niessen FB, Scheper RJ and Gibbs S. The keloid disorder: heterogeneity, histopathology, mechanisms and models. Front Cell Dev Biol 2020; 8: 360.

[2] Lu MZ, Ang QQ, Zhang X, Zhang LF, Yao XH, Lv H, Zheng XD and Lu WS. Genomic risk variants at 3q22.3 are associated with keloids in a Chinese Han population. Am J Transl Res 2018; 10: 554-562.

[3] Zhao Y, Liu SL, Xie J, Ding MQ, Lu MZ, Zhang LF, Yao XH, Hu B, Lu WS and Zheng XD. NEDD4 single nucleotide polymorphism rs2271289 is associated with keloids in Chinese Han population. Am J Transl Res 2016; 8: 544-555.

[4] Lu W, Zheng X, Liu S, Ding M, Xie J, Yao X, Zhang L and Hu B. SNP rs1511412 in FOXL2 gene as a risk factor for keloid by meta analysis. Int J Clin Exp Med 2015; 8: 2766-2771.

[5] Seifert O and Mrowietz U. Keloid scarring: bench and bedside. Arch Dermatol Res 2009; 301: 259-272.

[6] Shih B and Bayat A. Genetics of keloid scarring. Arch Dermatol Res 2010; 302: 319-339.

[7] Lu WS, Zheng XD, Yao XH and Zhang LF. Clinical and epidemiological analysis of keloids in Chinese patients. Arch Dermatol Res 2015; 307: 109-114.

[8] Bayat A, McGrouther DA and Ferguson MW. Skin scarring. BMJ 2003; 326: 88-92.

[9] Brown BC, McKenna SP, Siddhi K, McGrouther DA and Bayat A. The hidden cost of skin scars: quality of life after skin scarring. J Plast Reconstr Aesthet Surg 2008; 61: 1049-1058.

[10] Olaitan PB. Keloids: assessment of effects and psychosocial-impacts on subjects in a black African population. Indian J Dermatol Venereol Leprol 2009; 75: 368-372.

[11] Vensel E, Hilley T, Trent J, Taylor JR, Kirsner RS, Kerdel FA, Taylor JR and Schwartzberg JB. Sustained improvement of the quality of life of patients with psoriasis after hospitalization. J Am Acad Dermatol 2000; 43: 858-860.

[12] Wahl A, Loge JH, Wiklund I and Hanestad BR. The burden of psoriasis: a study concerning health-related quality of life among Norwegian adult patients with psoriasis compared with general population norms. J Am Acad Dermatol 2000; 43: 803-808.

[13] Bonicatto S, Dew MA, Soria JJ and Seghezzo ME. Validity and reliability of Symptom Checklist '90 (SCL90) in an Argentine population sample. Soc Psychiatry Psychiatr Epidemiol 1997; 32: 332-338.

[14] Al-Attar A, Mess S, Thomassen JM, Kauffman CL and Davison SP. Keloid pathogenesis and treatment. Plast Reconstr Surg 2006; 117: 286-300.

[15] Robles DT and Berg D. Abnormal wound healing: keloids. Clin Dermatol 2007; 25: 26-32.

[16] Chen MA and Davidson TM. Scar management: prevention and treatment strategies. Curr Opin Otolaryngol Head Neck Surg 2005; 13: 242-247.

[17] Bijlard E, Kouwenberg CA, Timman R, Hovius SE, Busschbach JJ and Mureau MA. Burden of keloid disease: a cross-sectional health-related quality of life assessment. Acta Derm Venereol 2017; 97: 225-229.