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Factors Affecting Quality Of Life in Patients with Hallux Valgus

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Abstract: Hallux valgus (HV) is a progressive chronic foot disease that can result in foot pain, limited motion, and changes in appearance, thus affecting patients' quality of life (QoL). The aim of this article is to explored HV patients' QoL and related factors.This cross-sectional study used purposive sampling. Data were collected from March to June 2015 from outpatients diagnosed with HV by two orthopedists in Taiwan. Materials included a self-designed hallux valgus quality of life (HV-QoL) questionnaire and HV angle data. SPSS 19.0 was used for statistical analysis. The total study sample was 95 patients. Results indicated that the effect factor of HV patients' QoL was the number of foot pain parts, using analgesic drug, postoperative time, and incline to have surgery. Patients who had surgery due to limited motion had the lowest QoL and the most common reason for surgery was foot pain, meaning that limited motion and foot pain had the greatest impact on patients' lives. Surgery was found to be an effective treatment to improve patients' satisfied to their foot appearance. HV patients experienced the effects of the condition in terms of their activity, pain, and appearance. The impact on patients was determined by foot pain area, medication, treatment method, and the duration of post-operative time. Medical staff should be aware of where the patient's quality of life is affected and provide appropriate assistance.
Keywords: Hallux valgus; Quality of life; Limited motion; Foot pain

INTRODUCTION

Hallux valgus (HV) is a foot deformity that affects many middle-aged and older adult women [1]. One study reported an HV prevalence rate of 35% to 65% among adults aged 40 or over, including a 30% prevalence rate among females of all ages [2].

HV is a progressive chronic foot affliction which mainly affects the first metatarsophalangeal joint(MTPJ), causing static subluxation, and is characterized by the abduction of the first phalanx and an adduction of the first metatarsal bone. HV leads to the development of a prominence on the metatarsal bone (i.e., a bunion) that results in external changes, pain, limited movement, and increased risk of falling [3-5]. Activity is a normal physiological function for maintaining physical and mental health. HV negatively affects patients' QoL by limiting activity in daily and social life [6]. Past studies also have shown that HV-induced pain is the main factor affecting patients' QoL and a major reason for surgery, followed by increased dissatisfaction with foot appearance and difficulties with choosing footwear [3-5, 7, 8].

Few comprehensive research has been conducted regarding QoL in HV patients. HV patients' QoL and related factors must be explored to improve patients' QoL and lay the foundation for future advancements. This study investigated QoL and related factors for HV patients in Taiwan.

MATERIALS AND METHODS

Study design

In this cross-sectional study, the participants were selected using a purposive sampling technique and consisted of HV patients from the Kaohsiung-Pingtung

region of Taiwan. A structured questionnaire and medical records were used to collect data regarding each patient's demographic characteristics, medical condition, treatment, and three HV affect aspect in QoL (pain, activity, and appearance). The participants consisted of outpatients treated by two orthopedists at a medical center and a regional teaching hospital.

Inclusion criteria

- diagnosed with HV by an orthopedist
- aged 20 years or over, and no sight or hearing impairments
- clear consciousness and able to communicate in Mandarin or Taiwanese

DATA COLLECTION

The effective sample included a total of 95 participants. This study was approved by the Institutional Review Board of target hospital. Data collection was conducted upon receiving informed consent. Data were collected from March to June 2015 in outpatient departments after approval from the two orthopedists. For those patients who agreed to participate, the doctor recorded the latest results for hallux valgus angle (HVA) and intermetatarsal angle (IMA) on HV angle record card. Once the consultation was finished, the study purpose and methods were explained to the patients in the waiting area. Participants then completed the questionnaire with the assistance of researchers who answered participants' questions if something was unclear. After being checked by the researchers for completion, the questionnaires were collected together with the patients' HV angle record card.

INSTRUMENTS

The main research tool used in this study was a structured questionnaire and medical record cards. Content collected included:

(1)Demographic characteristics: included gender, age, height, weight, work conditions (duration of physical activity and time spent in shoes), shoe wearing habits (heel height and toe cap width), family history, number of foot pain parts, number of chronic diseases, medical condition(HV-affected side and postoperative time), and treatment method (analgesic drug and current treatment way).

(2)HV affect aspect in QoL: a self-designed structured questionnaire was used to collect data in activity, pain, and appearance subsection. Participants were asked to answer questions related to their experiences during the preceding week. Questions were based on a 5-point Likert scale, with the answers 'strongly disagree', 'disagree', 'neither agree nor disagree', 'agree', and 'strongly agree' corresponding to the numbers 1 through 5, with higher values indicating less impact on patients' QoL. Among a total of 22 questionnaire items, 11 were related to activity, 9 were related to foot pain, and 2 were related to satisfaction with appearance. The content validity of the questionnaire was evaluated by two orthopedists, a public health expert, and two nursing specialists. All 22 items were preserved due to the content validity index (CVI) of each item being larger than 0.80. Results of a pre-test conducted among 20 patients indicated a Cronbach`s α value for the questionnaire of over 0.70, with 0.875 for the activity subsection, 0.889 for the pain subsection, 0.782 for the appearance subsection, and 0.93 for all the items. Thus, the questionnaire was proved to be internally consistent.

(3)HV angle record card: self-designed cards were used to collect information about participants' HVA and 1-2 IMA based on the latest data in their medical records. For patients who underwent surgery, data were collected regarding both pre- and post-operative angles.

Definitions

- HV affect aspect in QoL: based on the literature review, activity, pain, and appearance were determined as three major aspects affected by HV. The appearance aspect included satisfaction with the appearance of the foot and the ability to choose footwear.
- Satisfaction with appearance: HV patients' satisfaction with the appearance of HV-affected foot areas.
- Body mass index (BMI): BMI was computed using questionnaire responses and categorized according to the Ministry of Health and Welfare (2013) as follows: underweight (BMI < 18.5), normal weight (18.5 ≦ BMI < 24), overweight (24 ≦ BMI < 27), and obese (BMI ≧ 27) [9].

DATA ANALYSIS

All statistical analyses were performed using SPSS version 19.0 for Windows (SPSS Inc., Chicago, IL, USA). Descriptive statistics included frequency count, mean and standard deviation to describe basic information. Inferential statistics included the independent t-test, ANOVA followed by Scheffe's post hoc test, and pearson correlation coefficient were used to examine differences and relations between demographic characteristics, medical condition, and treatment method and self-designed HV QoL questionnaire(pain, activity, appearance, and total). Multiple linear regression analysis was applied to examine factors that affect QoL. A *p*-value less than 0.05 was considered to be statistically significant.

RESULTS

HV QoL questionnaire

HV-QoL questionnaire scores are presented in Table 1 to demonstrate the effect of HV on patients'

QoL. The mean scores for items in the Activity, Pain, and Appearance sub-sections were 33.5, 27.0, and 5.1, and the mean total score was 65.5.

Table-1: **HV-QoL questionnaire scores (n=95)**

Questionnaire item	Mean	SD
Activity	33.5	9.0
Pain	27.0	6.9
Appearance	5.1	2.0
Total score	65.5	16.2

Associations of Demographic characteristics and HV QoL questionnaire

An analysis of the differences between the HV-QoL questionnaire sub-sections (Table 2) showed that male patients, who did not using analgesic drugs, and who did not consider surgery had significantly higher scores in the activity sub-section. With regard to the pain sub-section, significantly higher scores were given by the patients who did not using analgesic drugs, who were not receiving any treatment at the time, and who did not consider surgery. The groups reached statistical significant difference during the postoperative time, but no significant difference was found in the post hoc tests. Yet we can still see that there are higher scores during 13-18 months after surgery, while the scores are the lowest during 1-6 months after surgery.

In the appearance sub-section, significantly higher scores were given by patients who had undergone surgery. The significant difference of F value shows in the postoperative time groups. The scores in 7-12 months postoperative time group and 13-18 months postoperative time group, significantly higher than the no surgery group and 1-6 months postoperative time group. Total scores were higher for those who didn`t using analgesic drugs, who didn`t consider surgery. The groups reached statistical significant difference during the postoperative time, but we didn't find significant differences between the groups after post hoc tests. Nevertheless, the scores of 13-18 months after surgery are higher, and those of 1-6 months after surgery are the lowest.

As seen in Table 3, activity subsection were found to be significantly negatively correlated to the larger IMA (one foot), younger age, longer durations of physical activity, pain in more areas of the foot, and have more chronic diseases. Pain subsection were found to be significantly negatively correlated to the number of foot pain parts (r=-0.409, P<0.01). The appearance subsection had positive correlated to postoperative time and the number of operated feet, whereas had a significant negative correlated to HVA (one foot), IMA (one foot), and the number of foot pain parts. Total questionnaire scores were negatively correlated to IMA (one foot), duration of physical activity, and the number of foot pain parts.

RESULT OF LINEAR REGRESSION ANALYSIS

To explore the main factors that affected HV patients' questionnaire subsection and total scores, stepwise linear regression analysis was conducted (Table 4). As seen from the results, the tolerance values of the variables ranged from 0.763 to 0.994 (> 0.10) and the variance inflation factor values ranged from 1.006 to 1.311 (< 10), indicating no multicollinearity between the variables.

Based on the statistical results, four factors had a significant effect on activity scores, explaining 27.5% of the variance. For instance, an increase in the number of chronic diseases and foot pain parts by 1 corresponded to decrease in the activity score by 3.059 and 2.741. Activity scores for patients who seek surgery for appearance were 10.216 points higher than those who did not consider surgery. Those who named limited motion the reason for surgery scored 5.155 points lower than those who did not consider surgery. Three factors had a significant effect on pain scores, explaining 32.0% of the variance. Increase of 1 foot pain part corresponded to a decrease in the pain score by 3.849. Those who named limited motion as the reason for surgery scored 5.132 points lower than those who did not consider surgery. Pain scores for overweight patients were 3.849 points higher than those for patients with normal weight.

Four factors had a significant effect on appearance scores, explaining 41.5% of the variance. Each month that had passed after surgery increased appearance scores by 0.103 points. Those who named limited motion as the reason for surgery scored 1.669 points lower than those who did not consider surgery. Appearance scores for underweight patients were 1.823 points lower than those of patients with normal weight. An increase in the number of operated feet by 1 corresponded to an increase in the appearance score by 0.673 points.

Overall, five factors explained 36.6% of the variance in questionnaire scores. An increase in the number of foot parts in pain by 1 corresponded with a decrease in the total score by 4.436 points. Those who named limited motion as the reason for surgery scored 17.408 points lower than those who did not consider surgery. An additional one month after surgery

corresponded with an increase of 0.529 points. Total scores for patients who had surgery as a treatment were 9.066 points lower compared to those who did not have surgery. An increase in the duration of physical activity by 1 hour corresponded with a decrease in total scores by 0.928 points.

Table-2: **Demographic characteristics HV-QoL questionnaire scores results**

Variable		Activity				Pain				Appearance				Total score			
	No.	Mean	SD	T/F value	Post hoc test	Mean	SD	T/F value	Post hoc test	Mean	SD	T/F value	Post hoc test	Mean	SD	T/F value	Post hoc test
Gender				2.205*				1.795				-0.031				1.988	
Male	24	36.92	9.36			36.92	9.36			5.04	2.14			71.08	16.85		
Female	71	32.32	8.64			32.32	8.64			5.06	1.93			63.61	15.62		
BMI				1.6				0.433				0.555				0.682	
Underweight	10	38.10	9.72			26.90	6.39			4.30	1.25			69.30	16.16		
Normal	48	31.98	8.69			26.21	7.22			5.10	2.09			63.29	16.60		
Overweight	26	33.50	7.56			28.00	5.04			5.15	1.74			66.65	11.78		
Obese	11	35.82	11.86			27.82	9.96			5.27	2.57			68.91	23.03		
Shoe toe cap				0.771				0.708				1.318				0.892	
Wide	82	33.77	8.96			27.16	6.92			5.16	1.96			66.09	16.29		
Narrow	13	31.69	9.42			25.69	7.11			4.38	2.02			61.77	15.56		
Family history				0.521				0.629				-0.806				0.46	
Yes	52	33.92	9.48			27.37	7.39			4.90	2.00			66.19	17.24		
No	43	32.95	8.47			26.47	6.37			5.23	1.95			64.65	14.97		
HV-affected foot				0.923				0.78				1.089				0.789	
Left	27	31.70	8.38			27.04	6.64			4.67	1.88			63.41	15.33		
Right	22	33.23	10.06			25.41	7.49			4.91	1.60			63.55	17.00		
Both	46	34.65	8.84			27.65	6.84			5.35	2.17			67.65	16.35		
Drug use				-3.209**				-2.578**				-0.763				-2.62*	
Yes	21	29.19	6.10			23.62	6.50			4.76	2.07			57.57	12.58		
No	74	34.70	9.35			27.91	6.78			5.14	1.95			67.74	16.45		
Surgery				0.046				-0.565				3.939***				0.187	
Yes	60	33.52	8.90			26.65	7.35			5.57	2.11			65.73	16.82		
No	35	33.43	9.30			27.49	6.19			4.17	1.34			65.09	15.26		
Treatment method				2.077				3.944*				0.434				2.419	
①No	20	37.60	9.42			31.10	6.00		①>④	4.95	1.61			73.65	15.32		
②Orthotic correction	8	34.63	8.31			27.13	5.17			4.75	1.58			66.50	12.26		
③ Rehabilitation	2	29.50	2.12			31.50	0.71			6.50	0.71			67.50	0.71		
④Surgery (plan/done)	65	32.20	8.80			25.52	6.98			5.08	2.15			62.80	16.43		
Reason for surgery				4.003*				3.82*				2.368				3.933*	
①no plan surgery	17	38.18	8.17		①>③	31.41	3.83		①>②	4.71	1.21			74.29	10.91		①>③
②Pain	63	32.84	9.08			26.24	6.99		①>③	5.13	2.07			64.21	16.74		
③Activity	12	28.33	6.43			23.83	8.16			4.50	2.11			56.67	14.71		

④Appearance	3	41.00	7.00			29.33	1.15			7.67	1.15			78.00	8.19		
Postoperative time (one foot; months)[a]				1.714				3.036*				17.086***				3.168*	
①No surgery	35	33.43	9.30			27.49	6.19		NS	4.17	1.34	③>①②		65.09	15.26		NS
②1~6	34	31.82	9.13			24.47	7.78			4.38	1.71	④>①②		60.68	16.80		
③7~12	13	35.85	5.74			29.54	3.97			7.31	0.85			72.69	9.56		
④13~18	8	39.50	7.19			32.13	6.24			7.38	1.77			79.00	14.58		
⑤19 or more	5	29.40	12.56			25.20	7.26			6.20	2.28			60.80	21.03		

[a]Number of months between the most recent hallux valgus surgery and the time of interviewing the participant.
Independent samples t-test and one-way ANOVA followed by Scheffe's post hoc test were used, with significance level of α=0.05.
* P<0.05 ** P<0.01 ***P<0.001。

Table-3: **Relations between demographic characteristics and HV-QoL questionnaire scores**

	Activity	Pain	Appearance	Total score
HVA (one foot)[a]	-0.086	-0.058	-0.311**	-0.112
IMA (one foot)[a]	-0.253*	-0.202	-0.281*	-0.260*
Age	-0.241*	-0.084	0.156	-0.151
BMI	-0.133	-0.014	0.072	-0.071
Duration of physical activity	-0.238*	-0.161	-0.184	-0.224*
Duration of shoe wearing	0.015	0.028	-0.137	0.003
Shoe heel height	-0.026	0.135	0.135	0.060
Number of foot pain parts	-0.260*	-0.409**	-0.290**	-0.355**
Number of Chronic diseases	-0.293**	-0.084	0.038	-0.194
Postoperation time(one foot; months)[b]	0.005	0.064	0.417**	0.081
Number of operated foot	0.027	0.013	0.410**	0.071

[a]Measurements of the foot with larger HVA were used as data for each patient.
[b]Amount of months between the latest hallux valgus surgery and the time of interviewing the participant.
*Pearson correlation coefficient analysis was used, with the significance level of α=0.05. * P<0.05 ** P<0.01 *** P<0.001

Table-4: **Factors affecting Activity, Pain, and Appearance**

Independent variable	Multiple correlation coefficient R	Coefficient of determination R^2	*p*value	Regression coefficient (B)	Standardized regression coefficient (β)	Tolerance	VIF
Activity	0.525	0.275					
Number of chronic diseases			0.006	-3.059	-0.309	0.93	1.075
Reason for surgery Dissatisfaction with the appearance[a]			0.023	10.216	0.254	0.942	1.062
Number of foot pain parts			0.008	-2.741	-0.288	0.994	1.006
Reason for surgery Limited motion[a]			0.044	-5.155	-0.221	0.961	1.041
Pain	0.566	0.320					
Number of foot pain parts			＜0.001	-3.849	-0.492	0.977	1.024
Reason for surgery Limited motion[a]			0.011	-5.132	-0.268	0.992	1.008
Overweight[b]			0.017	3.849	0.251	0.981	1.019
Appearance	0.644	0.415					
Postoperative time (one foot; months)			0.002	0.103	0.469	0.763	1.311
Reason for surgery Limited motion[a]			0.006	-1.669	-0.290	0.921	1.086
Underweight[b]			0.005	-1.823	-0.254	0.968	1.033
Number of operated feet			0.013	0.673	0.242	0.827	1.209
Total score	0.605	0.366					
Number of foot pain parts			0.024	-4.436	-0.248	0.852	1.173
Reason for surgery Limited motion[a]			＜0.001	-17.408	-0.398	0.889	1.125
Postoperative time (one foot; months)			0.006	0.529	0.316	0.792	1.263
Treatment Surgery[c]			0.018	-9.066	-0.259	0.876	1.141
Duration of physical activity			0.045	-0.928	-0.218	0.871	1.148

[a]control group - patients who did not consider surgery. [b]control group - patients with normal weight. [c]control group - patients who did not use any treatment.
Note: Linear regression and stepwise regression analysis were used.
Included variables: gender, BMI, shoe cap width, duration of activity, family history, number of foot pain parts, number of chronic diseases, HV-affected side, drug use, treatment method, surgery, number of operated feet, postoperative time, HVA (one foot), and IMA (one foot)

DISCUSSION

This study is consisted of 95 participants; the main purpose was to investigate the effects of HV on patients' QoL. In general, patients who use analgesic drugs had lower scores in activity, pain, and total questionnaire. A possible reason could be the analgesic drugs are normally used by those who experience pain, and pain will decrease activity. Patients who did not plan to have surgery had higher scores in activity, pain, and total score. This probably is that the effects of HV on these patients' lives were not critical enough for them to consider surgery as an HV treatment.

Analysis of variance between different time undergone surgery showed that it did not have significant effect on the activity sub-section, it affected the pain and appearances sub-section; patients who had undergone surgery within the preceding 6 months reporting the most pain and who did not had surgery had the lowest appearance scores. A previous study analyzed activity in HV patients who didn`t have surgery and healthy adults by dividing activities into work, sport, and leisure. HV patients were found to have the lowest scores in work and sporting activities [7]. A possible reason for the different findings in this study is the inclusion of only HV patients into the sample. It is supposed that post-surgery patients cannot reach the activity level of healthy adults.

Findings by Menz (2011) showed that HV patients had lower Manchester Foot Pain and Disability Index scores in pain and function subsection than healthy adults, and when foot deformation angle increase, patient will have more pain and less active function [1]. These findings were partially similar with this study. IMA was found to be negatively correlated with activity subsection. According to regression analysis results, both HVA and IMA are not important factors that affect the three subsections of the questionnaire. This is similar with previous studies, that the improvement of postoperative bone deformation angle and patient`s satisfaction has no directly related [5]**.** After the correction of skeletal deformities through surgery, the patient will relieve foot pain and improve foot function, and enhance the comfort of wearing shoes, these three variables are important factors affecting treatment satisfaction [5, 7, 8, 10].

In another study, 209 HV patients were observed for one year. The results show that postoperative group had higher scores in foot pain, foot pain intensity, ability to perform daily tasks, satisfaction with appearance, overall QoL score, footwear, and satisfaction with the treatment than the orthosis group and control group, whereas no significant difference was found between the orthosis and control groups. As such, the study indicated that surgery is the most effective method of HV treatment [11]. This did not correspond with the findings of this study. This study demonstrated significant differences in pain scores depending on the treatment method applied. Those patients who did not seek any treatment experienced less pain. A possible reason for this could be the fact that the sample in this study included patients who had been operated on within the preceding six months and, thus, still experienced pain from bones which had not fully recovered. In addition, it is suggested that those patients who planned to have surgery were likely to feel more pain than those who did not.

Another study examined QoL in 153 HV patients before and after surgery with the focus on activity, satisfaction with appearance, and pain. According to its results, the major changes experienced by participants included an improved ability to walk, followed by reduced pain and the ability to use normal footwear [8]. However, in this study, the only significant difference between operated and non-operated patients was related to appearance. A possible reason for these different findings could be the use of a cross-sectional design in this study.

The regression analysis results in this study revealed lower activity, pain, and total scores among those patients who experienced pain in more foot pain parts. Hill *et al*. (2008) found that participants with foot pain had significantly lower scores on bodily pain and physical functioning items of the Medical Outcomes Study Short Form 36 than participants without foot pain [12]. This is similar to the findings of this study, meaning that the number of foot pain part is an important predictor.

Compared to patients who did not seek surgical, activity scores were higher among those who had surgery because of dissatisfaction with foot appearance. The small sample size and participation of only postoperative patients in this group may be the reason to this difference. Patients who seek for surgery for limited motion were more painful than those who did not consider surgery. A possible reason for this could be the fact that patients who did not consider surgery had only slight foot deformities and, thus, did not experience severe pain.

Overweight patients were found to experience less pain than patients with normal weight. These results are partially similar to past findings. It was previously found that individuals with higher BMIs tended to wear shoes with flat soles and wide toe caps and, thus, experienced less pain [1]. The appearance scores for underweight patients were lower than those for patients of normal weight. This could be due to underweight group were significantly younger (the group average age was 26.6 years old, the average age

of other groups are 50-54 years, $p<0.001$), and as young people, were more concerned about their appearance.

Patients who had both feet operated were more satisfied with their appearance. Moreover, patients who had longer postoperative time had higher appearance and total scores. Similar to previous findings, these results suggested that surgery was the most effective solution for appearance and footwear issues [10].

Patients who took surgical had low total scores than those who did not seek treatment. The possible cause is surgery is not the primary treatment, and orthosis are more efficient in mild to moderate patients [10, 11]. The patients who use other therapies still unable to release the symptoms will choose surgery. And in this study most operated participants had undergone surgery just 1 to 6 months prior to the study and could have had lower scores due to post-surgery pain.

Limitations

This study explored QoL in HV patients. As the issue had not been previously discussed in Taiwan, the results can only be compared with those of related international studies. Such a comparison was difficult due to national and ethnic differences, as well as the use of different scales. Due to limited manpower and material resources, questionnaires were administered only in two hospitals. Thus, the results cannot be generalized. Moreover, as patients came to see an orthopedist, they were more likely to have a severe condition and more likely to consider having surgery. Data collected from more diverse populations were lacking, and the sample included only a few patients who did not seek surgical treatment. As a result, the effect of HV on non-surgery patients' QoL was not fully explored. Finally, as this was a cross-sectional study, this study could not fully examine the differences in patients' QoL before and after surgery or observe post-surgery QoL changes over a longer period of time. A quasi-experimental study design can be used in future research, and to investigate the issue of HV patients' QoL in great depth.

CONCLUSION

This study showed that HV has a negative effect on patients' lives in the aspects of activity, pain, and appearance. Analysis results indicated better QoL in patients who did not take medication, who had longer time after surgery, and did not seek surgical treatment. QoL was better in patients with pain in fewer areas of the foot. Patients who chose surgical treatment due to limited motion had lower QoL. The main reasons for surgery were to alleviate foot pain and improve foot function. This suggested that foot pain and limited motion had the most impact on HV patients' lives. Surgery was found to be an effective treatment that can improve patients' QoL. As time passed after the surgery, patients were more content with the appearance of the foot and had less difficulties choosing footwear.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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