



The long-term effects of microvascular decompression on social phobia and health-related quality of life in patients with hemifacial spasm: a 3-year prospective study

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Abstract

Background Although not a life-threatening condition, hemifacial spasm (HFS) frequently leads to social phobia because it causes significant facial disfigurement and consequently reduces health-related quality of life (HRQoL). The purpose of the current study was to examine the long-term effects of MVD on psychological aspects and HRQoL in HFS patients with social anxiety over a 36-month follow-up.

Methods Thirty patients with HFS who underwent MVD from January 2015 to May 2015 were included in this prospective study. Clinical data, including standardized measures of general anxiety and depression (Hospital Anxiety Depression Scale (HADS)), social anxiety (Liebowitz Social Anxiety Scale (LSAS)), and the severity of HFS, were collected postoperatively, and 6 months and 36 months after MVD. Likewise, data on HRQoL were collected at baseline, and 6 months and 36 months after MVD using the Korean version of the Short Form 36 (SF-36).

Results Twenty-two patients who completed the 36-month follow-up were classified into social phobia group and non-social phobia group based on the LSAS total scores of 60. Repeated measures analysis of variance demonstrated significant differences between the two groups over time for the total LSAS score ($p < 0.001$), anxiety subscale score of the HADS ($p = 0.002$), and the Mental Component Summary (MCS) ($p = 0.046$) of the SF-36. A comparison of these two groups in terms of differences observed in their scales at 6 months after MVD has shown that the improvements of the social phobia group in HADS anxiety subscale ($p = 0.010$), LSAS total score ($p = 0.008$), and MCS ($p = 0.040$) were significantly more improved than the those of non-social phobia group. And at 36 months after surgery, the improvement of the scales mentioned above was maintained, and additionally Vitality ($p = 0.040$) and Mental Health ($p = 0.040$) dimensions showed a statistically significant improvement.

Conclusions The improvements previously observed in psychological aspects and HRQoL over a short-term follow-up after MVD in HFS patients with social phobia were maintained for at least 36 months after MVD.

Keywords Health-related quality of life · Hemifacial spasm · Microvascular decompression · Social phobia · Liebowitz Social Anxiety Scale

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Abbreviations

HFS	Hemifacial spasm
MVD	Microvascular decompression
HRQoL	Health-related quality of life
LSAS	Liebowitz Social Anxiety Scale
HADS	Hospital Anxiety Depression Scale
SF-36	Short Form 36
PF	Physical Functioning
RP	Role-Physical
BP	Bodily Pain
GH	General Health
VT	Vitality

SF	Social Functioning
RE	Role-Emotional
MH	Mental Health
PCS	Physical Component Summary
MCS	Mental Component Summary
RMANOVA	Repeated measures analysis of variance

Introduction

Hemifacial spasm (HFS) is a motor disorder generally characterized by involuntary, irregular contractions of the ipsilateral facial muscles innervated by the facial nerve [19, 23]. The symptoms usually start from the orbicularis oculi muscle in the early stage, and then progress in frequency and severity, spreading downward to the ipsilateral facial muscles and even to the platysma [2]. Although HFS is not a life-threatening condition, patients with chronic facial disfigurement experience serious visual/verbal disability, and social embarrassment and significant distress in social interactions, which can lead to social phobia [21]. However, the relationship between social phobia and HFS has rarely been investigated.

Microvascular decompression (MVD) provides a curative treatment with long-term relief of symptoms by eliminating the neurovascular conflict of the facial nerve root. This treatment has excellent results with long-term spasm relief rates between 83 and 97% of patients [16]. However, consideration of symptom control rates and complications in the evaluation of MVD outcomes in patients with HFS is not enough because these parameters do not reflect the impact of this disfiguring physical condition on social functioning or psychological aspects. In a previous study with a 6-month follow-up period, we found that social anxiety symptoms are common among patients with HFS and that the presence of social phobia can adversely affect aspects of mental health in health-related quality of life (HRQoL). Moreover, in HFS patients with social phobia, MVD provides both resolution of the patient's facial twitch and improvements in psychological aspects and some dimensions of HRQoL related to mental health [13]. In the present study, to examine the long-term effects of MVD in these patients, we carried out additional follow-up assessments at 36 months after MVD.

Methods and materials

In this prospective study with a 36-month follow-up period, 30 consecutive patients (10 males and 20 females; mean age 51.6 ± 9.0 years; range 34–69 years) who underwent MVD performed by a senior neurosurgeon (J.W.C.) at Severance Hospital of Yonsei University were enrolled from January to October 2015. Twenty-two of the 30 patients (8 males and 14 females; mean age 52.2 ± 9.2 years; range 34–69 years)

completed the 36-month follow-up; two patients were excluded due to a refusal to respond to the questionnaire at 6 months, and another six patients were excluded due to loss to follow-up. As described in our previous study, written informed consent was received from all participants after the investigator provided them with information about the study. Patients were enrolled in the study if they provided informed consent and met no exclusion criteria, which consisted of accompanying movement disorders, heart failure, and pulmonary, renal, or hepatic insufficiency or malignancy. Patients were also excluded if they had cognitive impairment that prevented them from reliably answering the questions in the quality of life questionnaire and self-reported psychosocial assessment. The study was performed under a protocol approved by the Severance Hospital Institutional Review Board (4-2014-1090).

Preoperative evaluation routinely included magnetic resonance imaging, magnetic resonance angiography, computed tomography, and electrophysiologic studies such as nerve conduction study and electromyography. The hearing function of all patients was evaluated before MVD via subjective reports of hearing-related symptoms, physical examination by an otolaryngologist, and pure tone audiometry. Demographic data (i.e., age, gender, duration of symptoms, the severity score of HFS) were collected before surgery. Psychological data including the Leibowitz Social Anxiety Scale (LSAS) and Hospital Anxiety Depression Scale (HADS) were assessed before surgery, and at 6 months and 36 months after surgery. Patients with total LSAS scores of 60 or higher were considered to have clinically significant symptoms of social anxiety; a score of 11 or more on either the depression or the anxiety subscales of the HADS was considered to indicate a “probable case” of depression or general anxiety. HRQoL data were also collected at baseline, and 6 months and 36 months after MVD by using the Korean version of the Short Form 36 (SF-36).

The SF-36 is a generic HRQoL instrument that including 36 self-administered questions and measures eight dimensions, namely Physical Functioning (PF), Role-Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role-Emotional (RE), and Mental Health (MH), with higher scores (range 0–100) reflecting better-perceived health. Two summary scores, Physical Component Summary (PCS) and Mental Component Summary (MCS), are computed based on the eight dimension scores using regression weights derived from principal component factor analysis [24]. Three dimensions (PF, RP, and BP) correlate most highly with the physical factor and contribute most to the scoring of the PCS measure. The mental factor relates most profoundly with the MH and RE dimensions, which also contribute most to the scoring of the MCS. Three of the dimensions (VT, GH, and SF) correlate with both factors [6].

A neurosurgeon (Y.G.K.) and a well-trained nurse practitioner rated the severity of HFS before surgery, and at 6 and 36 months after surgery using the Hemifacial Scale: 0, no spasm; 1, mild, barely noticeable; 2, mild, without functional impairment; 3, moderate, functional impairment; and 4, severe, incapacitating. MVD was routinely performed with the patient in the lateral position by using a standard suboccipital retrosigmoid approach, as described in detail in a previous study [10]. After MVD, all patients immediately underwent postoperative computerized tomography to check for complications, including intracranial hemorrhage. After discharge, potential adverse effects and any changes in the patient's neurological state, including hearing function and physical state, were assessed at each follow-up visit by a neurosurgeon (Y.G.K.) and a well-trained nurse practitioner. At the last follow-up visit, the long-term clinical outcomes of MVD for HFS were used to classify patients into five groups according to the patients' subjective assessment of outcomes: (i) excellent, symptom free; (ii) good, more than 90% reduction; (iii) fair, 50–90% reduction; (iv) poor, less than 50% reduction; and (v) recurrence, relapsed spasm 1 year after MVD.

Statistical analysis

Quantitative variables were expressed as mean \pm standard deviation, and qualitative variables, as frequencies. The Kolmogorov-Smirnov test was used to assess the normal distribution of the variables. Intergroup comparisons were performed with the Mann-Whitney *U* test and Student *t* test for continuous variables and Fisher exact test for dichotomous variables. Paired *t* test and the Wilcoxon signed-rank test were used to determine statistical significance in a paired comparison. The effects of microvascular decompression on the psychological aspect and HRQoL during a follow-up of 36 months were evaluated with repeated measures analysis of variance (RMANOVA). If the RMANOVA for group-by-time interaction was significant, the Bonferroni post hoc analysis was conducted for between-time comparison. The *p* value was adjusted using the Bonferroni method. All data were analyzed with SPSS version 20.0 for Windows (SPSS, Chicago, IL, US). *p* values < 0.05 were considered statistically significant.

Results

Baseline characteristics, including age, sex, duration and severity of facial symptoms, years of education, and LSAS and HADS scores, did not differ significantly between the patients who completed all study visits (completers) and those who were lost to follow-up (dropouts) (Table 1). Among the completers, patients with a total LSAS score of 60 or higher were considered to

social phobia group, while the rest of the patients were classified to non-social phobia group. As reported in our previous study, sociodemographic and clinical characteristics of patients did not differ significantly between the two groups, except for the duration of facial symptoms ($p = 0.018$) and combined generalized anxiety ($p = 0.013$) (Table 2).

A comparison between groups of the results of the self-reported psychosocial assessments and HRQoL during the 36-month follow-up after MVD is presented in Table 3 and Fig. 1. The social phobia group had significantly higher scores in the Anxiety ($p < 0.001$) and Depression ($p < 0.001$) subscales of the HADS and a higher total score of the LSAS ($p < 0.001$) than did the non-social phobia group at baseline assessment. Also, the social phobia group showed greater impairment in the RP ($p = 0.024$), VT ($p = 0.012$), RE ($p = 0.033$), and MH ($p = 0.005$) dimensions and MCS ($p = 0.003$) of the SF-36 at baseline (Table 3). RMANOVA for group-by-time showed significant differences between the two groups over the 36-month follow-up for anxiety subscales of the HADS ($p = 0.002$), the LSAS ($p < 0.001$), and MCS ($p = 0.046$) of the SF-36. The post hoc analysis showed that within the social phobia group, there was a significant difference between baseline and 6 months and 36 months of follow-up assessments ($p < 0.05$ for all; Fig. 1). However, there was no significant difference between the baseline and 6 months and 36 months of follow-up assessments in the non-social phobia group ($p > 0.05$ for all; Fig. 1).

And a comparison of these two groups in terms of differences observed in their scales at 6 months after MVD has shown that the improvements of the social phobia group in HADS anxiety subscale ($p = 0.010$), LSAS total score ($p = 0.008$), and MCS ($p = 0.040$) were significantly higher than those of non-social phobia group. And at 36 months after surgery, the improvement of the scales mentioned above was maintained (HADS anxiety subscale, $p = 0.001$; LSAS total score, $p = 0.001$; and MCS, $p = 0.040$), and VT ($p = 0.040$) and MH ($p = 0.040$) dimensions also showed a statistically significant improvement (Table 4). In this study, all six patients who are considered to have social phobia improved based on the total LSAS score measured at 6 months after MVD, and it remained up to 36 months (Table 3).

Of the 22 patients enrolled in this study, 20 exhibited complete resolution or minimal spasm (excellent or good), one showed improvement with mild remnant spasm (fair), and one patient reported an unsatisfactory result (poor) at the final follow-up. The complication rate was 22.7% (5/22) over the 36-month follow-up, but there were no major complications, such as permanent neurological deficits or intracranial hemorrhage. Among the five complications, four were transient facial palsy and one was cerebrospinal fluid leakage that resolved spontaneously after absolute bed rest for 7 days [6].

Table 1 Baseline characteristics of the study population

	Total (<i>n</i> = 30)	Completers (<i>n</i> = 22)	Dropouts (<i>n</i> = 8)	<i>p</i> value
Age, years	51.6 ± 8.9	52.2 ± 9.2	49.9 ± 8.6	0.565 ^b
Sex (<i>n</i> , %)				
Male	10 (33.3)	8 (36.4)	2 (25.0)	0.682 ^c
Female	20 (66.7)	14 (63.6)	6 (75.0)	0.682 ^c
Duration of symptoms, years	4.9 ± 2.8	5.1 ± 3.1	4.3 ± 2.0	0.696 ^b
Severity of symptoms	2.4 ± 0.6	2.4 ± 0.6	2.3 ± 0.5	0.629 ^b
Education, years	13.0 ± 2.9	13.0 ± 3.0	13.1 ± 2.6	0.982 ^b
Liebowitz Social Anxiety Scale	38.5 ± 25.6	41 ± 27.4	29.9 ± 19.0	0.175 ^b
HADS ^a -Anxiety	5.8 ± 3.9	5.9 ± 4.4	5.5 ± 2.1	0.404 ^b
HADS-Depression	6.0 ± 3.5	6.1 ± 3.9	5.5 ± 2.3	0.440 ^b

Quantitative variables are expressed as mean and standard deviation

^a Hospital Anxiety Depression Scale

^b Statistical testing was performed using Student's *t* test and the Mann-Whitney *U* test

^c Statistical testing was performed using Fisher's exact test

Discussion

Social phobia is a syndrome characterized by fear and avoidance of social situations that may expose the person to scrutiny while performing a specific task or interacting with other people. This fear of humiliation or embarrassment leads to significant social withdrawal and dysfunction. Diagnosis of social phobia with the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV) requires that social anxiety symptoms not be related to a medical condition, but social phobia can be associated with various disfiguring or disabling physical conditions, such as essential tremor, Parkinson's disease, spasmodic torticollis, stuttering, and strabismus [1, 4, 8, 9, 22].

As mentioned above, although HFS is not a life-threatening condition, involuntary closure of the eyelids can impair visual function, and twitching of the mouth can affect speech, leading to headaches, inattention, and irritability in patients [20]. Moreover, some patients with HFS have reported that their main handicap is social embarrassment due to facial disfigurement when interacting with other people. These problems may lead to low self-esteem, social isolation, and, consequently, social phobia. However, the relationship between social phobia and HFS has seldom been highlighted and is likely to be underestimated.

To our knowledge, only three previous studies have assessed social phobia and HFS. Ozel-Kizil et al. [18]

Table 2 Sociodemographics and clinical characteristics of subjects according to LSAS score among the completers [13]

	Total (<i>n</i> = 22)	Social phobia (<i>n</i> = 6)	Non-social phobia (<i>n</i> = 16)	<i>p</i> value
Age, years	52.2 ± 9.2	49.8 ± 6.0	53.1 ± 10.2	0.494 ^c
Sex (<i>n</i> , %)				
Male	8 (36.4%)	2 (33.3%)	6 (37.5%)	1.000 ^d
Female	14 (63.6%)	4 (66.7%)	10 (62.5%)	1.000 ^d
Duration of symptoms, years	5.1 ± 3.1	7.8 ± 2.2	4.1 ± 2.8	0.018 ^c
Severity of symptoms	2.4 ± 0.6	2.3 ± 0.8	2.4 ± 0.5	0.494 ^c
Education, years	13.0 ± 3.0	11.7 ± 2.6	13.4 ± 3.0	0.203 ^c
Comorbidity disorders				
General anxiety (HADS-A ^a ≥ 11)	3/22 (13.6%)	3/6 (50.0%)	0/16 (0.0%)	0.013 ^d
Depression (HADS-D ^b ≥ 11)	3/22 (13.6%)	2/6 (33.3%)	1/16 (6.3%)	0.169 ^d

Quantitative variables are expressed as mean and standard deviation

^a Hospital Anxiety Depression Scale: Anxiety subscale

^b Hospital Anxiety Depression Scale: Depression subscale

^c Statistical testing was performed using Student's *t* test and the Mann-Whitney *U* test

^d Statistical testing was performed using Fisher's exact test

Table 3 Self-reported psychosocial assessments and HRQoL comparing the social phobia group with the non-social phobia group during 36 months of follow-up

	Social phobia (<i>n</i> = 6)			Non-social phobia (<i>n</i> = 16)			<i>p</i> value ^c	<i>p</i> value ^d
	Baseline	6 Months	36 Months	Baseline	6 Months	36 Months		
HADS^a								
Anxiety	11.3 ± 4.1	4.8 ± 2.3	5.2 ± 1.7	4.0 ± 2.2	2.9 ± 2.4	4.1 ± 2.7	< 0.001	0.002
Depression	9.8 ± 3.5	5.5 ± 3.0	6.3 ± 3.8	4.8 ± 3.0	3.1 ± 2.7	4.6 ± 3.2	< 0.001	0.216
LSAS^b								
	77.3 ± 23.8	24.2 ± 21.1	35.5 ± 15.5	30.1 ± 16.6	18.1 ± 15.4	22.9 ± 17.8	< 0.001	< 0.001
SF-36								
Physical Functioning	48.2 ± 4.1	49.3 ± 7.8	54.3 ± 3.1	50.6 ± 6.2	51.1 ± 8.9	51.7 ± 7.8	0.157	0.307
Role-Physical	43.8 ± 9.4	50.0 ± 6.3	51.5 ± 5.8	51.5 ± 9.3	54.0 ± 4.1	49.5 ± 9.6	0.024	0.083
Bodily Pain	49.9 ± 8.0	54.7 ± 9.0	49.0 ± 8.1	52.7 ± 10.7	55.7 ± 7.8	50.7 ± 9.0	0.395	0.944
General Health	38.3 ± 7.1	44.3 ± 8.0	47.1 ± 5.5	46.5 ± 10.0	48.7 ± 9.6	49.1 ± 11.1	0.059	0.439
Vitality	37.5 ± 8.1	45.8 ± 7.9	49.6 ± 8.8	50.9 ± 11.5	51.9 ± 11.0	47.6 ± 13.7	0.012	0.069
Social Functioning	40.5 ± 10.9	50.0 ± 6.6	51.5 ± 5.9	48.0 ± 9.1	53.1 ± 6.2	53.3 ± 8.6	0.100	0.541
Role-Emotional	36.4 ± 13.5	52.0 ± 4.9	48.6 ± 7.8	47.9 ± 12.9	54.0 ± 4.0	47.9 ± 11.3	0.033	0.109
Mental Health	35.0 ± 6.8	44.8 ± 10.0	50.2 ± 6.8	49.1 ± 11.1	53.5 ± 9.1	50.7 ± 7.3	0.005	0.088
Physical Component Summary	50.4 ± 5.9	50.5 ± 9.4	51.1 ± 7.1	52.1 ± 5.9	52.1 ± 8.4	50.8 ± 8.0	0.566	0.701
Mental Component Summary	32.4 ± 9.4	47.1 ± 9.6	49.0 ± 8.6	48.2 ± 9.5	52.7 ± 9.2	49.3 ± 9.4	0.003	0.046

Quantitative variables are expressed as mean and standard deviation

^aHospital Anxiety Depression Scale

^bLiebowitz Social Anxiety Scale

^cHigh-LSAS group vs. low-LSAS group at baseline (statistical testing was performed using the Mann-Whitney *U* test)

^dHigh-LSAS group vs. low-LSAS group for 36 months (statistical testing was performed using the repeated measures analysis of variance test)

conducted a study of 20 HFS patients and reported that 20% met the modified DSM-IV criteria (ignoring criterion H which excludes social anxiety due to a general medical condition). And they also reported that younger age and depressive symptoms were both correlated with the severity of secondary social anxiety as measured by total LSAS scores, and that the duration or severity of HFS was not associated with social phobia. Dias et al. [7] demonstrated that patients with blepharospasm or HFS did not show significant differences in the frequency (8/22; 36.3% and 7/29; 24.1% respectively) and severity of social phobia as diagnosed by a modified DSM-IV. Also, in our previously published research on this study population, 6 (21.4%) of 28 HFS patients had social phobia (LSAS total score \geq 60), and among clinical characteristics, only the duration of facial spasm and combined generalized anxiety were significantly higher in HFS patients with social anxiety. The frequencies reported in these studies are considerably higher than the rates of primary social phobia in the general population [12]. Although two of the three studies used the Structured Clinical Interview for DSM-IV, administered by an experienced psychiatrist, while our study documented prevalence based on self-reported LSAS scores, all of the prevalence are very similar, suggesting that the self-reported LSAS is also a useful instrument for evaluating social anxiety symptoms of patients with HFS.

The LSAS was developed in 1987 as the first instrument specifically designed for the evaluation of social phobia [15]. It was originally designed as a clinician-administered scale consisting of 24 items on two subscales, which assess the patient's symptoms of fear and avoidance of social situations in the previous week. However, the expansion of interest in the LSAS as an index of social phobia has led some researchers to evaluate its utility as a self-report measure. For example, Baker et al. reported that the LSAS-SR shows good overall psychometric properties as indicated by the results of test-retest reliability, internal consistency, and convergent and discriminant validity [3]. The LSAS has been translated into various languages, including Korean, and its reliability and validity have been confirmed. For example, the Korean version of the LSAS used in the present study has high reliability and verified validity [11].

MVD is widely accepted as an effective and safe neurosurgical intervention for HFS patients, and several studies have documented the effect of MVD on HRQoL. Montava et al. reported that MVD is an effective and durable treatment for HFS, with significant improvements in HRQoL over a long-term follow-up [17]. Jian Cheng et al. reported that HRQoL in patients with HFS is significantly impaired in both the physical and mental health domains. Also, they found that patients with severe HFS symptoms or a higher educational level are at

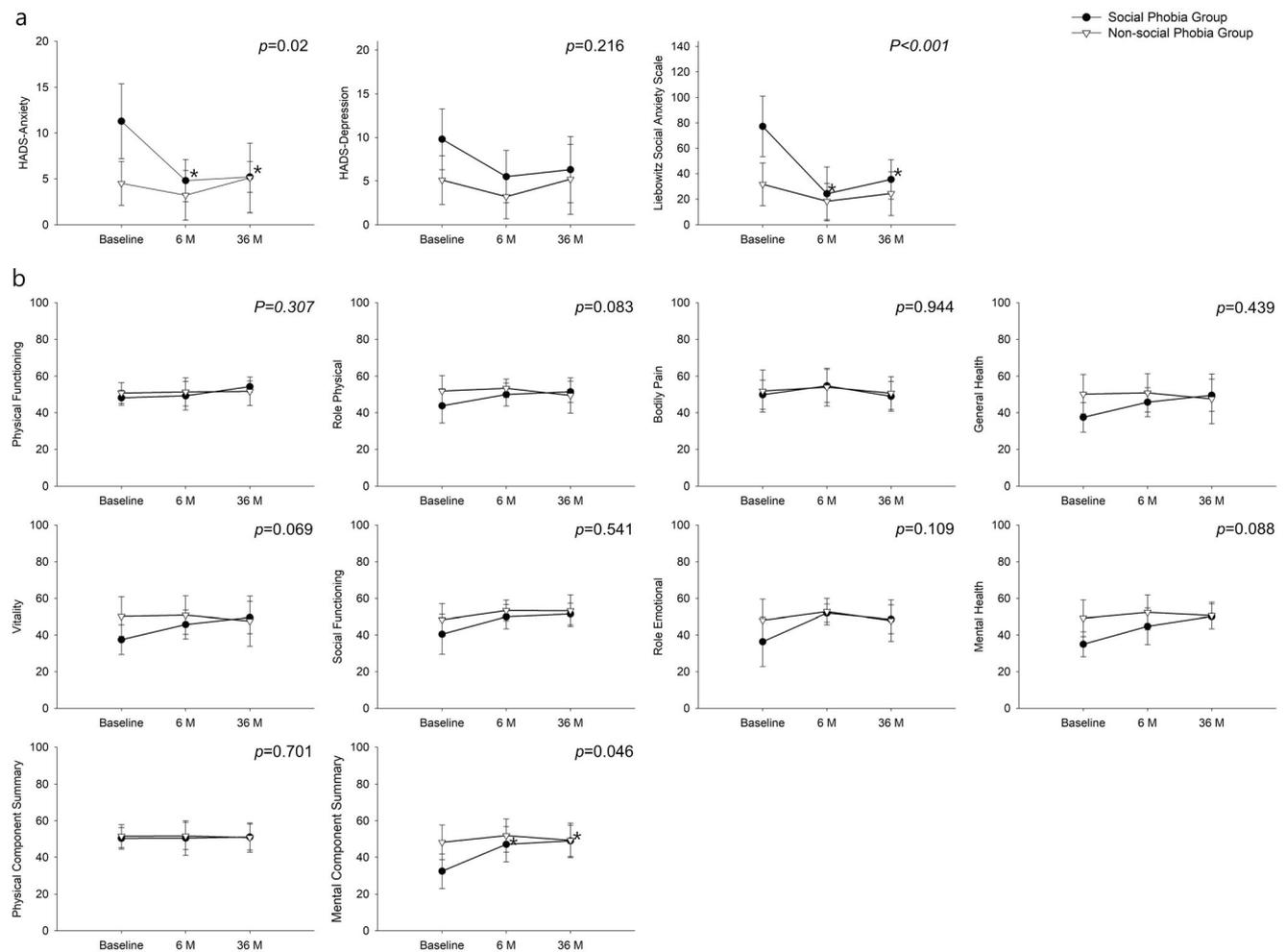


Fig. 1 The changes in the self-reported psychosocial assessments and HRQoL during the 36-month follow-up after microvascular decompression: **a** HADS-A, HADS-D, and LSAS. **b** Eight dimensions and two summary components of the SF-36. *p* value: repeated measures analysis of variance. Asterisks (*): Statistically significant difference between

baseline and follow-up assessments at 6 and 36 months; Bonferroni post hoc analysis; $p < 0.05$. HRQoL, health-related quality of life; HADS-A, Hospital Anxiety Depression Scale-Anxiety subscale; HADS-D, Hospital Anxiety Depression Scale-Depression subscale; LSAS, Liebowitz Social Anxiety Scale; SF-36, Short Form 36

higher risk of worse HRQoL and that patients experience significant improvement in HRQoL after MVD [5]. In a study that investigated HRQoL in patients with HFS following intervention with MVD and botulinum toxin, the authors reported that MVD might offer an increased benefit for HRQoL over botulinum toxin injections [14].

However, the only study that has investigated the effects of MVD on psychological aspects and HRQoL in HFS patients with social anxiety is our previously published short-term follow-up study. In that study [13], we found that social anxiety is common among patients with HFS and that the presence of social anxiety can adversely affect aspects of mental health in HRQoL. Over the 6-month follow-up, after MVD, patients with HFS seemed to gain benefits from MVD not only for their facial twitch but also for social anxiety symptoms that may be related to mental health in quality of life.

In the current long-term follow-up study, we found significant differences between the social phobia group and the non-social phobia group during the 36-month follow-up in anxiety subscales of the HADS, the total LSAS score, and MCS of the SF-36 (Fig. 1). And through the comparison of two groups in terms of differences observed in their scales at six and 36 months after MVD, along with the improvement of the HADS anxiety subscale, total LSAS score, and MCS, which were observed at 6-month follow-up, VT and MH dimensions which correlate highly with the mental factor, also showed a statistically significant improvement at 36 months after MVD (Table 4). The results from our study indicate that the improvements observed in psychological aspects and mental health in HRQoL at 6 months after MVD were maintained for at least 36 months after treatment.

Therefore, when evaluating the outcome of MVD in HFS, clinicians should be aware that it is not enough to consider only the improvements in disfigurement and the occurrence of adverse

Table 4 The difference observed in the scale of both group during 36 months of follow-up

	Social phobia (<i>n</i> = 6)		Non-social phobia (<i>n</i> = 16)		<i>p</i> value ^d	<i>p</i> value ^e
	Baseline–6 months Difference Median [(min)–(max)]	Baseline–36 months Difference Median [(min)–(max)]	Baseline–6 months Difference Median [(min)–(max)]	Baseline–36 months Difference Median [(min)–(max)]		
HADS^a						
Anxiety	3.50 [(3.00)–(16.00)]	5.00 [(4.00)–(14.00)]	1.00 [(– 6.00)–(8.00)]	0.50 [(– 8.00)–(5.00)]	0.010	0.001
Depression	4.00 [(– 1.00)–(11.00)]	3.00 [(– 3.00)–(11.00)]	1.00 [(– 3.00)–(13.00)]	0.00 [(– 8.00)–(7.00)]	0.235	0.203
LSAS^b						
	53.00 [(13.50)–(106.00)]	49.00 [(20.00)–(94.00)]	11.00 [(– 18.00)–(41.00)]	6.50 [(– 18.00)–(38.00)]	0.008	0.001
SF-36^c						
Physical Functioning	– 1.35 [(– 10.50)–(6.30)]	– 6.275 [(– 15.24)–(2.92)]	0.00 [(– 16.80)–(12.60)]	– 1.87 [(– 9.68)–(18.04)]	0.590	0.154
Role-Physical	– 7.40 [(– 14.70)–(4.90)]	– 5.695 [(– 29.66)–(5.82)]	0.00 [(– 26.90)–(7.30)]	– 0.26 [(– 12.10)–(24.19)]	0.134	0.134
Bodily Pain	– 2.35 [(– 21.50)–(2.30)]	4.42 [(– 15.10)–(12.89)]	0.00 [(– 32.60)–(17.70)]	1.56 [(– 21.14)–(12.89)]	0.329	0.971
General Health	– 3.65 [(– 14.90)–(1.00)]	– 6.215 [(– 26.51)–(1.18)]	0.00 [(– 31.90)–(20.10)]	– 2.695 [(– 17.89)–(19.76)]	0.407	0.407
Vitality	– 6.25 [(– 28.10)–(3.20)]	– 8.785 [(– 31.44)–(– 0.99)]	– 0.50 [(– 23.89)–(18.82)]	– 0.99 [(– 15.22)–(29.21)]	0.231	0.040
Social Functioning	– 8.15 [(– 27.30)–(5.50)]	– 11.875 [(– 33.24)–(9.10)]	– 2.75 [(– 16.30)–(10.90)]	– 3.24 [(– 33.24)–(14.50)]	0.693	0.231
Role-Emotional	– 13.65 [(– 35.00)–(0.00)]	– 12.385 [(– 35.27)–(10.18)]	0.00[(– 38.90)–(7.80)]	– 0.27 [(– 29.14)–(27.17)]	0.070	0.231
Mental Health	– 8.45 [(– 22.50)–(0.00)]	– 14.965 [(– 26.17)–(3.81)]	– 4.20 [(– 36.60)–(22.50)]	– 0.96 [(– 20.02)–(15.48)]	0.261	0.040
Physical Component Summary	2.80 [(– 12.30)–(5.30)]	0.09 [(– 17.71)–(6.38)]	0.00 [(– 16.90)–(11.80)]	– 1.525 [(– 4.84)–(17.15)]	0.541	0.590
Mental Component Summary	– 13.10 [(– 39.90)–(– 0.40)]	– 19.275 [(– 32.50)–(9.59)]	– 2.95 [(– 36.00)–(11.50)]	– 1.505 [(– 23.89)–(18.82)]	0.040	0.040

^aHospital Anxiety Depression Scale^bLiebowitz Social Anxiety Scale^cShort Form 36^dDifference between baseline and 6 months (statistical testing was performed using the Mann-Whitney *U* test)^eDifference between baseline and 36 months (statistical testing was performed using the Mann-Whitney *U* test)

events because these factors do not reflect the impact of HFS on psychosocial aspects. We should continue to aim to improve the surgical outcomes of MVD as well as the social phobia associated with facial spasm and the long-term effects of MVD on psychological aspects and HRQoL.

This study had some limitations. For example, some patients were lost to follow-up, which may have contributed to selection bias. However, there were no significant differences in baseline characteristics between patients who did and did not complete the surveys. Also, we did not know why some patients withdrew from this study, although we attempted to contact patients by various means. If recurrence or worsening of facial twitching was the cause for withdrawal, then our results may have been biased. Furthermore, the participants tended to have more severe symptoms of HFS because they were patients who underwent MVD. Thus, the results may not

reflect the condition of all patients with HFS in the general population. Because psychosocial data were collected with a self-administered questionnaire rather than an interview with a psychiatrist, interpretation of the data requires caution. In future studies, measures should be taken to minimize the drop-out rate during follow-up, and more reliable data should be obtained through cooperation with the psychiatry department.

Conclusions

The short-term improvements previously observed in psychological aspects and HRQoL in HFS patients with social phobia who underwent MVD were maintained for at least 36 months after treatment.

Compliance with ethical standard

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors declare that they have no conflict of interest.

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