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van Veen, Martinus M; Quatela, Olivia; Tavares-Brito, Joana; Robinson, Mara; Baiungo, Jennifer H; Werker, Paul M N; Dijkstra, Pieter U; Hadlock, Tessa A

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Patient-perceived severity of synkinesis reduces quality of life in facial palsy: A cross-sectional analysis in 92 patients

1 | INTRODUCTION

Facial synkinesis is a disfiguring condition caused by aberrant nerve regeneration following facial nerve insult.[1] The condition is characterised by involuntary contraction of one or more muscle groups during voluntary movement of another muscle group and may lead to a decreased quality of life.[2] Several assessment methods are available for synkinesis, of which clinician-grading scales are commonly used.[3,4] A patient-reported outcome measure is also available; the Synkinesis Assessment Questionnaire (SAQ) is a short 9-item questionnaire investigating patient-perceived severity of synkinesis.[5]

Recent evidence suggests that a patients' perspective on synkinesis severity may provide valuable additional information not incorporated in clinician grading of facial function. Specifically, statistical prediction of quality of life for patients with non-flaccid facial palsy had a lower explained variance compared to that of flaccid facial palsy patients.[6] The aim of this study was to analyse whether the addition of patient-perceived severity of synkinesis to clinician-graded facial function permits better prediction of quality of life in facial palsy patients.

2 | METHODS

Institutional review board approval was obtained prior to the start of this study. Between February and April 2018, a consecutive series of facial palsy patients visiting the physical therapy clinic of a tertiary Facial Nerve Center was invited for participation. Patient charts were reviewed for patient characteristics. Bilateral facial palsy patients and patients under the age of 18 were not eligible for participation, since the eFace is intended for unilateral facial palsy, and the questionnaires have not been validated for use in children.

Before the physical therapy appointment, patients were asked to answer the SAQ[5] to assess perceived severity of synkinesis and the Facial Clinimetric Evaluation (FaCE) scale to assess facial palsy-related quality of life.[7] Both physical therapists graded facial function during the therapy session using the clinician-graded electronic facial paralysis assessment (eFace) facial function[3] scale and collected the questionnaires.

2.1 | Statistical analysis

Descriptive data were presented using frequencies and percentages, medians and interquartile ranges (IQR), and means and standard deviations (SD) when appropriate. Univariate linear regression analyses were performed to identify which variables might be associated ($P < 0.1$) with FaCE total score for a nested multivariate linear regression model. The change in explained variance (R^2 change) was examined, to establish the relative contribution of all relevant variables in predicting FaCE total score. The first model included only the eFace total score as a measure of overall facial function, the second model additionally included relevant patient characteristics. In the final model, the SAQ total score as a measure of patient-perceived synkinesis severity was included. Significance level of $P > 0.05$ for removing a variable from the final model was applied.

In the primary analysis, multiple imputation was performed to estimate missing data. Additionally, a complete case sensitivity analysis was performed.

3 | RESULTS

Of the 135 unilateral facial palsy patients visiting the physical therapy clinic, 92 could be included in the current study (68%). Patients were not included in the study either because they were late or missed by the investigator (n = 30), or because there was no time to perform an eFace during the therapy session (n = 13).

A majority of the included patients were female (n = 71 [77%]), and median (IQR) age at the time of study was 53.5 (34.0; 64.1) years. More than half of the patients presented with facial palsy as a result of Bell's palsy (n = 48 [52%]). Median (IQR) duration of facial palsy was 1.2 (0.5; 3.6) years. Approximately two-thirds of the patients (n = 60 [65%]) were included during a follow-up visit (median: 5th visit-range: 2nd to 23rd visit). Median (IQR) eFace total score was 77.0 (68.8; 86.0) points with a median (IQR) eFace synkinesis subscore of 82.0 (63.0; 94.8) points; median (IQR) SAQ total score was 49.6 (35.5; 63.4) points. The 92 patients included in the current study had a relatively short duration of palsy and a slightly different distribution of aetiologies compared to the 43 patients not included (Table 1).

For 10 patients, the answer to one SAQ question was missing, resulting in 1.2% missing SAQ values. Multiple imputation according to the Markov Chain Monte Carlo method was used to overcome this problem, and concurrent pooled data analysis was highly accurate (relative efficiency = 1.000) and very similar to the results of the complete case analysis (Appendix S1).[8] SAQ total score and eFace synkinesis subscore were significantly associated

(Spearman's $\rho = -0.609$, $P < 0.001$). In univariate linear regression analyses, eFace total score and being measured at follow-up were positively associated with FaCE total score (Table 2). Female gender and SAQ total score were negatively associated with FaCE total score (Table 2; Figure 1).

Nested multivariate linear regression models demonstrated that eFace total score was the most important predictor of FaCE total score ($R^2 = 0.252$, $P < 0.001$). The relevant patient characteristics of gender and visit type increased the explained variance by 6.4% (R^2 change = 0.064, $P = 0.020$). Inclusion of the SAQ total score in the regression model increased the explained variance with 11.3% to a total explained variance of 42.8% ($R^2 = 0.428$, R^2 change = 0.113, $P < 0.001$; Table 3).

4 | DISCUSSION

4.1 | Synopsis of key findings

Most studies of facial synkinesis involve evaluation of different treatments, not the influence of synkinesis on quality of life. The authors of the Dutch language version SAQ report a weak correlation between the SAQ total score and both the physical function of the Facial Disability Index (Spearman's $\rho = -0.290$, $P < 0.05$) and the social/well-being function of the Facial Disability Index (Spearman's $\rho = -0.320$, $P < 0.05$).[9] In a recent study, FaCE total scores were statistically predicted using regional facial grading items of the eFace in two groups of facial palsy patients: one flaccid and one non-flaccid. A much lower explained variance of quality of life in the non-flaccid facial palsy patients was found compared to the flaccid facial palsy patients. Together with the relative unimportance of synkinesis items of

Keypoints

- Synkinesis can decrease quality of life in facial palsy patients.
- Patient-perceived severity of synkinesis may be of additional value in predicting facial palsy-related quality of life.
- We analysed the additional value of the Synkinesis Assessment Questionnaire (SAQ) total score (perceived severity of synkinesis) in predicting FaCE total scores (quality of life) in 92 patients cross-sectionally.
- SAQ total score accounted for a relatively large improvement in the prediction of FaCE total scores (R^2 change = 0.113, total $R^2 = 0.428$).
- Patient-perceived severity synkinesis should be included in clinical management and studies of synkinesis.

the eFace in the prediction of quality of life in the "non-flaccid" group, this finding suggests that the addition of the patients' perspective of synkinesis severity may be of additional value. In this study we have shown that patient-perceived synkinesis severity contributed significantly to the statistical prediction of facial palsy-related quality of life.

Other variables predictive of facial palsy-related quality of life were eFace total score, gender and type of visit. The eFace total score explained 25.2% of the FaCE total score, a finding similar to other literature reports.[6,10] Likewise, lower quality of life scores in female patients compared to males and the small proportional

TABLE 1 Patient characteristics

	Included patients (n = 92)	Excluded patients (n = 43)	P-value
Age, years (median [IQR])	53.5 (34.0; 64.1)	57.3 (35.1; 67.8)	0.291[a]
Female gender (n [%])	71 (77.2)	29 (67.4)	0.292[b]
Aetiology (n [%])			<0.001[c]
Bell's palsy	48 (52.2)	10 (23.3)	
Ramsay Hunt	16 (17.4)	4 (9.3)	
Lyme	9 (9.8)	2 (4.7)	
Acoustic neuroma resection	9 (9.8)	7 (16.3)	
Head and neck tumour	4 (4.3)	6 (14.0)	
Iatrogenic	4 (4.3)	2 (4.7)	
Temporal bone fracture	1 (1.1)	3 (7.0)	
Congenital	0 (0.0)	2 (4.7)	
Other/unclear	1 (1.1)	7 (16.3)	
Duration of palsy, years (median [IQR])	1.2 (0.5; 3.6)	3.5 (0.8; 9.1)	0.038[a]
Follow-up visit (n [%])	60 (65.2)	30 (69.8)	0.697[b]

Abbreviations: IQR, interquartile range; n, number.
[a]Mann-Whitney U test.
[b]Chi-Squared test.
[c]Fisher's exact test.

TABLE 2 Univariate linear regression results on FaCE total score

	Regression coefficient	CI lower limit	CI upper limit	P-value
Age (years)	−0.191	−0.426	0.045	0.112
Duration of palsy (years)	0.025	−0.457	0.507	0.919
eFace total score	0.772	0.497	1.047	<0.001
Gender (0 = male, 1 = female)	−11.055	−19.839	−2.271	0.014
SAQ total score	−0.365	−0.543	−0.188	<0.001
Viral aetiology (0 = no, 1 = yes)	3.968	−4.925	12.861	0.382
Visit type (0 = initial evaluation, 1 = follow-up)	10.805	3.125	18.486	0.006

Abbreviations: CI, confidence interval; SAQ, Synkinesis Assessment Questionnaire.
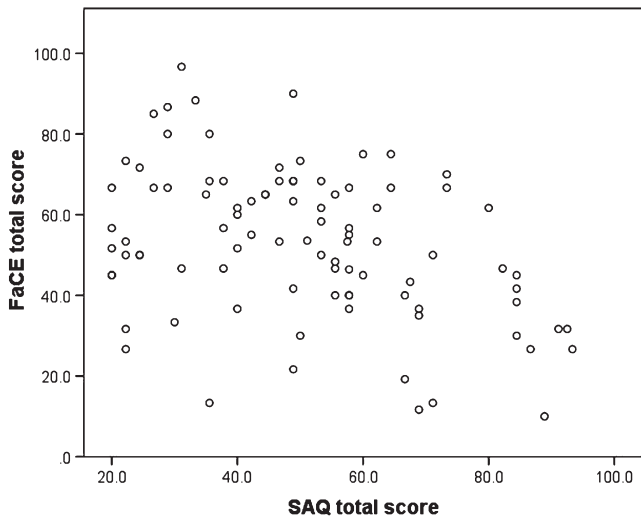
FIGURE 1 Scatterplot of SAQ total scores and FaCE total scores

contribution of patient characteristics in predicting facial palsy-related quality of life (model 2: R^2 change = 0.064) are in line with the literature.[10]

Interestingly, follow-up patients presented with a higher quality of life compared to patients who were measured at initial evaluation. Literature regarding the effect of physical therapy on quality of life in facial palsy is scarce; only one study reports improved quality of life after physical therapy.[2] Conclusions about the effect of physical therapy on quality of life cannot be made from these data, due to our cross-sectional study design.

4.2 | Limitations

We were able to include 92 out of 135 (68%) unilateral facial palsy patients who visited a physical therapy clinic during the 10-week inclusion period. We did not perceive any relevant difference in patient characteristics between our groups that could pose a form of selection bias. Non-inclusion was practically random, since it depended heavily upon clinic volume and flow. Socially desirable answering was limited by giving patients the freedom to populate the FaCE scale and SAQ without a researcher present, while waiting for their physical therapy appointment, although the questionnaires were collected by the physical therapists.

TABLE 3 Multivariate linear regression results

Model	Variable	B	CI LL	CI UL	Sig. B	R^2	R^2 change	Sig. change
1	eFace	0.772	0.497	1.047	<0.001	0.252	0.252	<0.001
2	eFace	0.669	0.394	0.944	<0.001	0.315	0.064	0.020
	Gender (0 = male, 1 = female)	−7.676	−15.383	0.032	0.051			
	Visit type (0 = initial evaluation, 1 = follow-up)	7.391	0.565	14.218	0.034			
3	eFace	0.571	0.314	0.829	<0.001	0.428	0.113	<0.001
	Gender (0 = male, 1 = female)	−7.670	−14.758	−0.582	0.034			
	Visit type (0 = initial evaluation, 1 = follow-up)	8.788	2.470	15.106	0.006			
	SAQ total score	−0.318	−0.469	−0.166	<0.001			

Abbreviations: B, regression coefficient; CI, confidence interval; LL, lower limit; SAQ, Synkinesis Assessment Questionnaire; UL, upper limit.

Missing data were unfortunate consequences of a rapidly paced clinical environment. Ten single answers to a SAQ question were missing in our questionnaires, resulting in 1.2% missing SAQ values. We chose to impute the missing data, so we would not have to exclude these patients all together. For purposes of comparison, the analysis results of the 82 complete cases were added (Appendix S1) which were very similar to our imputed data set results. Although modern imputation techniques are common and offer a good solution for missing data, it offers only an estimate of the missing original data. However, due to our small amount of missing data, our imputation models and concurrent pooled analysis were highly accurate.

4.3 | Future implications

Clinician-graded and patient-perceived synkinesis severity is reported to correlate, but correlations range between 0.364 and 0.769.[5,9] Given that both constructs, clinician-graded severity of synkinesis and patient-perceived severity of synkinesis, are related but not identical, it is not surprising that this correlation is only moderate. Most authors of treatment evaluation studies report only their post-treatment outcome on one of these constructs. Given the results of the current study we advocate the use of both measurements for clinical and research purposes. The SAQ is a short, easy to administer and easy to answer questionnaire that is already available in English[5] and Dutch,[9] and is currently being translated and validated for use in a Spanish American and Brazilian Portuguese population.

5 | CONCLUSIONS

Patient-perceived severity of synkinesis is an important predictor of facial palsy-related quality of life in non-flaccid facial palsy patients. The patients' perception of synkinesis should be an integral part of treatment evaluation of synkinesis.

CONFLICT OF INTEREST

None to declare.

ORCID

Martinus M. Veen https://orcid.org/0000-0003-2233-2068

Martinus M. van Veen[1,2]
Olivia Quatela[1]
Joana Tavares-Brito[1]
Mara Robinson[1]
Jennifer H. Baiungo[1]
Paul M. N. Werker[2]
Pieter U. Dijkstra[3]
Tessa A. Hadlock[1]

[1]*Facial Nerve Center, Department of Otolaryngology/Head and Neck Surgery, Massachusetts Eye and Ear Infirmary and Harvard Medical School, Boston, Massachusetts*
[2]*Department of Plastic surgery, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands*
[3]*Department of Rehabilitation Medicine, Department of Oral and Maxillofacial Surgery, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands*

Correspondence
Martinus M. van Veen, Facial Nerve Center, Department of Otolaryngology/Head and Neck Surgery, Massachusetts Eye and Ear Infirmary and Harvard Medical School, Boston, MA.
Email: m.m.van.veen@umcg.nl

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Additional supporting information may be found online in the Supporting Information section at the end of the article.