Comparison of generic health survey SF-36 and arrhythmia related symptom severity check list in relation to post-therapy AF recurrence

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Aim The effect of applied therapy on quality of life (QoL) in patients with atrial fibrillation (AF) was investigated in recent studies. However, no information on clinical relevance of QoL assessing instruments in relation to post-ablation recurrence of AF is currently available. The aim of this study was to evaluate the clinical relevance of SF-36 and Arrhythmia Related Symptom Severity Check List (SSCL) to post-procedure AF recurrences in patients with paroxysmal AF undergoing pulmonary vein isolation (PVI).

Methods and results Sixty consecutive patients with AF were enroled in the study. The QoL was measured using SF-36 scale and SSCL. The questionnaires were administered at baseline then 3, 6, 9 and 12 months after the procedure. In order to define statistical power in relation to AF recurrence the scores were dichotomized. Positive and negative predictive accuracy (PPA, NPA) and test efficiency (sum of PPA and NPA) were calculated. Twenty-one out of 60 patients experienced a total of 66 recurrences of AF during follow-up. The parameters of SF-36 provided maximum test efficiency of 1.36, whereas the test efficiency of SSCL was 1.79.

Conclusion We conclude that SSCL is more specific instrument for a measurement of PVI success or failure.
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Key Words: Atrial fibrillation, catheter ablation, quality of life, pulmonary vein isolation.

Introduction

The effect of applied therapy on health related quality of life (QoL) in patients with atrial fibrillation (AF) has been investigated in recent studies[1–8]. The improvement of QoL after catheter ablation has been reported in several studies[1–6]. A significant improvement of QoL has been observed after pharmacological treatment[7,8] and after the MAZE-procedure[9]. The QoL in these studies was assessed using two instruments, generic health survey SF-36[1–5] and Arrhythmia Related Symptom Severity Check List (Bubien and Kay's Symptom Checklist) (SSCL)[1–6]. In two studies[2,7] patients with recurrent AF have also demonstrated modest but significant benefit, though it was less pronounced compared with patients without recurrence of AF during follow-up. However, the clinical relevance of QoL assessed in patients who were treated for AF but developed recurrence of the arrhythmia has not yet been evaluated. The aim of the present study was to investigate the clinical relevance of SF-36 and SSCL to post-procedure AF recurrences in patients with paroxysmal AF undergoing pulmonary vein isolation (PVI).

Methods

The study population comprised 60 consecutive patients with paroxysmal AF (39 men, mean age: 58 ± 11 years, left ventricular ejection fraction $> 55\%$) refractory to >3 antiarrhythmic drugs. Additionally antiarrhythmic drugs class III 29 patients (48.33 %) received β-blockers due to systemic hypertension. All procedures were performed under general anaesthesia. During the catheter procedure, an infusion of heparin was maintained to achieve

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an activated clotting time >300 s. Diagnostic quadripolar catheters (Biosense Webster) were positioned in the right lateral atrium and the coronary sinus. In addition, one mapping catheter (Lasso™, 10 polar, Biosense Webster, Diamond Bar, CA, U.S.A.) and one saline cooled ablation catheter (Cool tip™, Chilli, Cardiac Pathways, Sunnyvale, CA, U.S.A.) were placed in the pulmonary veins, using a transseptal approach (SL-1™, St Jude, Division Daig). The ablation catheter was placed proximal to the mapping catheter at the atrial side of the pulmonary vein ostium. Primary ablation sites were the ostial region with the verification of fractionated signals of myofibrils. The aim of the ablation strategy was the electrical disconnection of the pulmonary veins in which we could localize the described signals. The PVI was verified by the proof of an entrance- and exit-block of each treated PV.

All study patients were highly symptomatic before treatment and had documented, on 24 h Holter ECG, AF episodes lasting longer than 30 s. The QoL was measured using generic health survey short-form questionnaire SF-36 (BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role-emotional; RP, role-physical; SF, social functioning; VT, vitality; all scored from 0 to 100) and arrhythmia specific instrument SSCL including palpitations, dyspnoea, dizziness, exercise intolerance, chest discomfort, and syncope scored from 0 (no symptoms) to 48 (severe symptoms). Recurrence of AF was evaluated using a portable event recording system and clinical examination. We defined an AF recurrence as a documented AF episode lasting 30-s duration and/or clinical symptoms of AF relapses.

The antiarrhythmic drugs were discontinued 1 week before the procedure. Patients were asked to answer the questionnaires 1 day before the radiofrequency ablation procedure and then 3, 6, 9 and 12 months after the ablation procedure. The differences in scores at baseline, 3, 6, 9 and 12 months were separately analysed for patients with and without AF recurrence during follow-up. The analysis was performed using the Mann–Whitney U test. We used this non-parametric test because the scores were not normally distributed. The relationships among SF-36 subscales and between SF-36 and SSCL were tested using Spearman correlation analysis. The dichotomization of the continuous variables is widely used to assess the performance of a diagnostic test. In order to define performance of scores in relation to AF recurrence the scores were dichotomized. The statistical parameter describing discrimination between two variables is χ^2. The high value χ^2 indicates significant discrimination. The dichotomy limits or cut-off points of continuous variables have to be selected at the maximum of χ^2. The cut-off points were tested at 10, 20, 30, 40, 50, 60, 70, 80 and 90% percentiles and χ^2 were calculated. The dichotomy limits were defined according to the maximum χ^2. Positive and negative predictive accuracy (PPA, NPA) and test efficiency (sum of PPA and NPA) were calculated. The differences were considered significant by error probability $P < 0.05$.

Results

The antiarrhythmic drugs were discontinued after the procedure. However, 29 patients with hypertension continued to receive β-blockers. Twenty-one of 60 patients experienced a total of 66 AF episodes during follow-up. The mean follow-up was 6.7 ± 3.3 months. All study patients filled questionnaires. There were no significant differences in the incidence rate of AF recurrence between 3, 6, 9 and 12 months.

As depicted in Table 1, 3 months after the procedure all patients without AF recurrence had improvement in QoL in all scales of SF-36 and in SSCL (Table 1). With the exception of BP scale the improvements persisted 1 year after the PVI without significant changes between 3, 6, 9 and 12 months in this patient group. At 9 and 12 months after PVI the BP score was not significantly different from the baseline value.

In patients having recurrence of AF at 3 months after the procedure the means and medians of GH, MH, PF, RE, SF and VT scores increased (Table 2). However, the significant improvements could be revealed only in MH scale of SF 36 and in SSCL. Among other variables only SF and RE scores were close to the significance threshold at 3 months after the PVI. In the MH scale and in the SSCL improvements were maintained during follow-up regardless of recurrence of AF at next follow-up (Table 2). The SF score has shown significant improvement at 6 months after PVI compared with baseline. The improvement in SF score remained significant at 9 months and was close to the significance threshold at 12 months. As depicted in Table 2 all other SF 36 scales have shown significant fluctuations during follow-up in patients who had recurrence of AF during follow-up. There were no differences in sex and age between patients with AF recurrence and those without.

As shown in Table 3, there is modest but significant correlation among all SF-36 subscales (r from 0.34 to 0.71; $P < 0.001$ for all correlations) and all SF-36 subscales inversely correlated with SSCL (r from −0.31 to −0.50; $P < .001$ for all correlations).

No patients reported syncope during follow-up. The improvements in other items of SSCL with respect to the AF recurrence are shown in Table 4. As depicted in Table 4 the improvement was observed in each item of SSCL in patients without AF recurrence and in those with AF recurrence. The most expressed reduction of the symptom severity was observed in palpitation in patients without AF recurrence. The reduction of the severity of other symptoms was also more expressive in patients without AF recurrence but not as strong as reduction of palpitation severity.

There were significant differences in all scores between patients with post-ablation AF recurrence and those without (Table 5). Although MH, PF and RP subscales of SF 36 have shown high NPA, the PPA was not above 55% in these scales. The cut-off points discriminating scores in relation to the recurrence of the arrhythmia are given in Table 5. As shown in Table 5, the parameters of SF-36 provided maximum test efficiency of 1.36, whereas

Table 1 Effect of PVI on QoL in patients without post-ablation recurrence of AF

		BP	GH	MH	PF	RE	RP	SF	VT	SSCL
Baseline	Median	62.00	47.00	52.00	65.00	33.33	25.00	62.50	35.00	22.50
	Mean	**64.71**	**49.36**	**54.66**	**61.99**	**47.49**	**29.79**	**57.62**	**41.13**	**23.30**
	SD	29.43	18.06	19.06	23.43	45.13	35.99	26.09	18.16	7.62
3 M	Median	92.00	62.00	76.00	85.00	100.00	100.00	93.75	57.50	6.00
	Mean	**83.86**	**63.50**	**72.07**	**80.89**	**68.45**	**68.75**	**83.93**	**55.45**	**7.29**
	SD	20.05	13.47	17.26	18.62	39.93	39.88	20.82	16.26	2.03
	P-value	**<0.002**	**<0.001**	**<0.001**	**<0.001**	**<0.02**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
6 M	Median	100.00	62.00	72.00	85.00	100.00	75.00	100.00	55.00	6.00
	Mean	**84.73**	**62.50**	**70.73**	**77.50**	**69.70**	**56.82**	**81.82**	**57.84**	**7.50**
	SD	26.33	18.87	18.70	21.47	40.09	43.26	25.76	18.62	2.17
	P-value	**<0.003**	**<0.002**	**<0.001**	**<0.003**	**<0.03**	**<0.007**	**<0.001**	**<0.001**	**<0.001**
9 M	Median	74.00	54.50	66.00	82.50	100.00	100.00	81.25	58.75	7.50
	Mean	**76.44**	**57.83**	**65.67**	**73.33**	**71.30**	**68.06**	**75.69**	**57.78**	**8.00**
	SD	21.71	18.67	19.85	24.66	39.21	37.32	22.23	19.47	2.45
	P-value	**<0.06**	**<0.05**	**<0.02**	**<0.02**	**<0.03**	**<0.001**	**<0.005**	**<0.001**	**<0.001**
12 M	Median	74.00	64.50	78.00	85.00	100.00	100.00	100.00	52.50	6.00
	Mean	**71.71**	**66.07**	**67.71**	**83.93**	**80.95**	**67.86**	**80.36**	**56.61**	**6.64**
	SD	27.49	15.42	21.60	15.83	32.65	39.73	32.98	17.87	1.23
	P-value	**>0.20**	**<0.001**	**<0.005**	**<0.006**	**<0.001**	**<0.002**	**<0.002**	**<0.002**	**<0.001**

the test efficiency of SSCL was 1.79 in our study patients.

Discussion

Similar to the previous studies[1–6] improvement in QoL was found in all of our patients undergoing catheter ablation (Tables 1 and 2). However, with the exception of the study of Gerstenfeld *et al.*[2], all other authors[1,3–6] investigated the effects of the catheter procedure on QoL in AF patients without distinguishing between those who had recurrence and those who did not have AF recurrence.

In the present study, we found that the patients who developed post-ablation recurrence of AF had smaller, but significant benefit in QoL. The most expressive improvement in patients with AF recurrence was found in MH and SF subscales, the RE subscale has also

Table 2 Effect of PVI on QoL in patients with post-ablation recurrence of AF

		BP	GH	MH	PF	RE	RP	SF	VT	SSCL
Baseline	Median	62.00	47.00	52.00	65.00	33.33	25.00	62.50	35.00	22.50
	Mean	**64.71**	**49.36**	**54.66**	**61.99**	**47.49**	**29.79**	**57.62**	**41.13**	**23.30**
	SD	29.43	18.06	19.06	23.43	45.13	35.99	26.09	18.16	7.62
3 M*	Median	42.00	50.00	68.00	80.00	100.00	25.00	75.00	50.00	12.00
	Mean	**56.24**	**51.84**	**62.56**	**68.80**	**64.00**	**39.00**	**67.50**	**44.60**	**13.08**
	SD	28.45	18.74	19.33	21.27	43.12	40.67	28.06	19.69	4.79
	P-value	>0.10	>0.20	**<0.05**	<0.10	<0.06	>0.20	<0.06	>0.10	**<0.001**
6 M*	Median	74.00	57.00	72.00	75.00	50.00	0.00	81.25	50.00	9.00
	Mean	**73.41**	**56.14**	**68.18**	**72.05**	**53.03**	**36.36**	**77.84**	**48.86**	**10.77**
	SD	22.07	17.41	15.47	15.86	43.41	42.46	18.82	18.40	3.09
	P-value	>0.10	<0.06	**<0.002**	**<0.05**	>0.20	>0.30	**<0.001**	**<0.02**	**<0.001**
9 M*	Median	62.00	57.00	72.00	75.00	33.33	25.00	62.50	50.00	12.00
	Mean	**60.35**	**53.83**	**70.00**	**70.56**	**44.44**	**36.11**	**70.83**	**46.11**	**12.83**
	SD	29.73	13.97	11.13	14.76	41.41	40.33	19.23	17.58	4.12
	P-value	>0.30	>0.10	**<0.02**	<0.06	>0.30	>0.20	**<0.05**	<0.08	**<0.001**
12 M*	Median	70.00	50.00	68.00	75.00	100.00	50.00	62.50	45.00	15.00
	Mean	**72.00**	**51.55**	**64.73**	**70.45**	**72.73**	**36.36**	**70.45**	**44.09**	**13.91**
	SD	23.25	15.91	12.86	17.90	34.28	28.93	17.08	14.11	3.90
	P-value	>0.20	>0.30	**<0.05**	>0.10	**<0.05**	>0.10	<0.06	>0.10	**<0.001**

*All analysed scores correspond to the AF recurrence at follow-up time.

Table 3   Correlations between QoL scales

		BP	GH	MH	PF	RE	RP	SF	VT	SSCL
BP	r	1.00	0.50	0.39	0.44	0.34	0.44	0.46	0.38	−0.31
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
GH	r	0.50	1.00	0.55	0.50	0.37	0.48	0.54	0.58	−0.41
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MH	r	0.39	0.55	1.00	0.45	0.58	0.50	0.65	0.71	−0.42
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PF	r	0.44	0.50	0.45	1.00	0.48	0.68	0.57	0.61	−0.44
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
RE	r	0.34	0.37	0.58	0.48	1.00	0.58	0.55	0.53	−0.33
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
RP	r	0.44	0.48	0.50	0.68	0.58	1.00	0.60	0.66	−0.48
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
SF	r	0.46	0.54	0.65	0.57	0.55	0.60	1.00	0.61	−0.50
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
VT	r	0.38	0.58	0.71	0.61	0.53	0.66	0.61	1.00	−0.45
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
SSCL	r	−0.31	−0.41	−0.42	−0.44	−0.33	−0.48	−0.50	−0.45	1.00
	P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

showed a trend towards improvement at 3 months after the PVI. The improvement in these subscales may be related to the placebo effect. This result is in agreement with the previous work by Gerstenfeld et al.[2] who reported that patients with recurrent AF after ablation had a significant improvement in generic QoL and symptom severity compared with baseline. In the study of Gerstenfeld et al.[2] the moderate but significant improvements were found in all QoL scales also in patients with AF recurrence. However, they compared all post-ablation scores with baseline without distinguishing between follow-up times. In contrast with their study we have compared all post-ablation scores with pre-ablation scores with respect to follow-up time. The statistical

difference between QoL and SSCL parameters of patients with AF recurrence and those without AF recurrence was also not investigated in the Gerstenfeld study[2].

Dorian et al.[7] separately analysed the dynamics of SSCL in AF patients without recurrence and those who had recurrence of the arrhythmia after pharmacological treatment. They found modest but significant benefit in symptom severity in patients who developed AF recurrence compared with baseline. In agreement with our results they also found that patients without AF recurrence had significantly lower value of SSCL compared with those with AF recurrence. They found an improvement in SF-36 following treatment in all patients. However, the differences in SF-36 scales

Table 4   Effect of the PVI on symptom severity

		Palpitations	Dyspnea	Dizziness	Exercise intolerance	Chest discomfort
Baseline (%)		99	75	71	70	48
Success						
3 M	Sx%Δ	−74	−61	−71	−55	−48
	LΔ	−3.10	−1.73	−1.97	−2.00	−1.19
6 M	Sx%Δ	−68	−54	−67	−58	−44
	LΔ	−3.04	−1.57	−1.91	−1.91	−1.14
9 M	Sx%Δ	−76	−36	−71	−58	−48
	LD	−3.14	−1.40	−1.97	−1.92	−1.19
12 M	Sx%Δ	−84	−75	−71	−67	−41
	LΔ	−3.24	−1.95	−1.97	−2.06	−1.10
Recurrence						
3 M	Sx%Δ	−7	−31	−39	−30	−44
	LΔ	−1.77	−1.30	−1.37	−1.39	−1.14
6 M	Sx%Δ	−12	−58	−58	−41	−35
	LΔ	−1.89	−1.73	−1.81	−1.62	−1.03
9 M	Sx%Δ	0	−38	−46	−25	−17
	LD	−1.54	−1.41	−1.66	−1.33	0.72
12 M	Sx%Δ	0	−34	−46	−25	−23
	LΔ	−1.33	−1.43	−1.66	−1.32	−0.88

Sx%Δ, difference between percent of patients with symptoms before and after PVI; LΔ, difference in mean symptom level before and after PVI.

Table 5 Differences in QoL scales between patients with and without post-ablation AF recurrence

Scale	Mean ± SD success	Mean ± SD recurrence	Cut-off	PPA*	NPA[†]	Test efficiency	P
BP	79.69 ± 24.94	64.99 ± 27.69	62.00	0.60	0.70	1.30	<0.01
GH	62.24 ± 16.88	53.09 ± 17.26	50.00	0.65	0.69	1.34	<0.01
MH	69.25 ± 19.39	65.95 ± 15.98	80.00	0.48	0.80	1.28	<0.05
PF	78.61 ± 20.87	71.12 ± 18.20	85.00	0.50	0.82	1.32	<0.01
RE	70.68 ± 39.70	59.65 ± 42.62	66.67	0.51	0.66	1.17	<0.05
RP	64.46 ± 41.20	37.83 ± 39.68	75.00	0.55	0.82	1.37	<0.01
SF	81.02 ± 25.10	71.71 ± 22.86	75.00	0.59	0.77	1.36	<0.01
VT	56.36 ± 18.40	46.32 ± 18.23	43.50	0.60	0.67	1.27	<0.02
SSCL	7.55 ± 2.58	12.67 ± 4.26	9.00	0.88	0.91	1.79	<0.001

*Positive predictive accuracy.
[†]Negative predictive accuracy.

between patients with AF recurrence and without AF recurrence were not analysed in that study[7].

In the recently published PIAF study[8], the SF-36 was compared between patients randomized to rhythm control or rate control. Although only 10% patients randomized to the rate control strategy and 56% patients randomized to the rhythm control strategy remained in sinus rhythm after a 1-year follow-up period, no significant differences in SF-36 scales were found in this study. This result suggests that SF-36 is not a specific instrument for a measurement of the success of AF therapy.

Although the significant differences in SF-36 scales between patients, who had and who did not have AF recurrence, were found in our study (Table 5), the statistical power of SF-36 scales regarding discrimination between patients with AF recurrence and arrhythmia free patients is clearly below the power of the SSCL. The observed significance but modest correlation between SSCL and SF-36 subscales (Table 3) support this finding. We concluded that SSCL is a more specific instrument for a measurement of PVI success or failure and should be used in practice.

The limitation of this study: the appropriate number of patients required for a clinical trial can be estimated from a pilot study. Thus, the present study has to be considered as a pilot study.

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