Expectation, satisfaction and clinical outcome of patients after total knee arthroplasty

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Abstract

Purpose There is a well-known difference between patients expectation, satisfaction and the measured clinical outcome in total knee arthroplasty (TKA). It has been hypothesized that higher expectation prior to surgery and higher satisfaction will show better clinical outcome according to well-established scoring systems, frequently used for assessment after TKA.

Methods A consecutive group of 102 patients was included who received TKA for degenerative osteoarthritis. A modified patients expectation form was used prior and 8 months after surgery. Furthermore, the KSS, WOMAC and SF-36 served for patient assessment. Patients were grouped in responder and non-responder according to their level of expectation and fulfilment of expectation after surgery using a Likert scale.

Results A total of 54 patients (53%) showed expectation prior to surgery of 1 or 2 and a satisfaction after surgery of 1 or 2 according to the Likert scales. These patients were classified as responders. Considering the continuous parameters of KSS, SF-36 and WOMAC, a few statistically significant differences were found between the responders and non-responders at baseline (pre-surgery) and at the fulfilment of their expectation after surgery. Patient expectation prior to surgery did not differ between both groups. The more satisfied patients showed significant better results in the KSS, WOMAC and SF-36 after surgery. The parameters general health (SF-36) and role emotional (SF-36) measured prior to surgery dominate the predictive potential to get a responder with sensitivity of 74%, specificity of 81% and a rate of correct classification of 78%.

Conclusion This study has shown that patient satisfaction correlates well with the clinical outcome according to the KSS, WOMAC and SF-36. The indication for TKA should consider the general health, emotional role and knee function of the patients as well in order to predict patient's outcome.

Level of evidence II.

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Introduction

Patient satisfaction is the most important outcome measurement. Good clinical and functional outcome does not always confirm patient satisfaction. The difference between patients and clinicians outcome rating is well known [24]. In general, there is a trend of over-assessment of the results by the physician [4].

Solely the Knee Society Score (KSS) does not seem to be appropriate for patient assessment after total knee arthroplasty (TKA) [6]. Only low to moderate relationship has been observed between self-reported and performance-based tools.

Both assessment forms are needed for the true assessment of the patient outcome [15].

On the one hand, constant effort has been made to improve the prosthetic design, implant placement and surgical technique. Computer-assisted surgery gives one example. The main goal is to improve patients outcome and implant lifetime. On the other hand, there is a lack of knowledge about patient expectation and the fulfilment of their expectation after TKA. Despite the perfectly implanted and well-balanced TKA, some of the patients are not completely happy with their surgeries. There might be patient-related factors, which surgeons have to pay more attention to in order to achieve the best outcome for each individual patient.

It has been reported that 85% of the patients expected fully pain release after TKA but only 43% of them became pain free after surgery. Similar findings were observed for function. The majority of patients (52%) expected no functional limitation after surgery, which was only achieved in 20% of the patient [28]. It is still unclear why the difference between the expectation and the fulfilment of patient expectation is so remarkable.

Thus, the current study focused on patient's expectation after TKA. The aim was to search for an interaction between patient expectation, fulfilment of their expectation and the clinical outcome in TKA. We hypothesize that high patient expectation prior to surgery and high satisfaction after surgery will show better clinical outcome according to well-established scoring systems after TKA. The hypothesis is based on previous findings, which have shown that patient expectation might have an impact on the global outcome after TKA [9].

Materials and methods

A prospective study of 102 consecutive patients with knee osteoarthritis scheduled for TKA was conducted. All patients received cemented, fixed-bearing hyperflex total knee arthroplasty (NexGen™, Zimmer®, Warzawa, IN, USA). Six patients had a different type of implant (Scorpio™, Stryker®, Allendale, NJ, USA) and were excluded. None of the patients received patella resurfacing. Surgery was performed on 48 right and 54 left knees.

The mean age of the 73 female and 29 male patients was 71.5 ± 8 years, and the body mass index was 31 ± 5.6 kg/cm². Seventy patients (61.8%) were married, 28 patients (27.4%) were widowed and 11 patients (10.8%) were single, apart living or divorced. Sixty-seven patients (67.6%) lived with a partner, and the remaining 33 patients (32.4%) lived alone.

A modified patient expectation form was used and answered by the patient prior to surgery and at the time of

Table 1 Mean and standard deviation of the categories pain, function and stiffness of the WOMAC prior surgery and at the 8 month of follow-up (FU)

WOMAC	Prior to surgery	8 months FU	P-value
Pain	30.4 ± 10.4	10.76 ± 9.6	$P \leq 0.001$
Function	97.9 ± 35.9	41.7 ± 34.3	$P \leq 0.001$
Stiffness	11.9 ± 5.1	5.48 ± 4.6	$P \leq 0.001$

follow-up [22]. The self-assessment form included 15 questions evaluating patient's expectation using a Likert scale from 1 to 5 (1—very important, 2—important, 3—less important, 4—relevant and 5—not relevant) (Table 1). According to the 15 questions, the patients were asked again 8 month after TKA surgery for evaluation of the fulfilment of patients expectation using the same Likert scale from 1 to 5 (1—true, 2—almost true, 3—partially true, 4—rather not true and 5—not true) (Table 2).

The clinical assessment was based on the Knee Society Score (KSS), Western Ontario Mc Master University Score (WOMAC) and Short form 36 (SF-36).

The KSS, the most commonly used scoring system for patient's evaluation after TKA, is divided into a knee score and a function score [19]. The knee score assesses the knee joint itself for knee pain, range of motion and stability. The knee function score rates the patient's ability to walk and to climb stairs. Each score allows for a maximum rating of 100 points. The score is based on a 75% of subjective and 25% objective assessment.

The WOMAC score gives a subjective evaluation of the knee and consists of three main domains: pain, stiffness and function [3]. The score was translated and validated into German by Stucki et al. [30].

The SF-36 is a self-administration form and includes eight scales such as: 1. limitation in physical activity, 2. limitation in social activities, 3. limitations in usual role activities, 4. bodily pain, 5. general mental health, 6. limitations in usual role activities, 7. vitality and 8. general health perceptions [33]. Each scale consists of a different number of items [31]. The SF-36 separates between two aggregated dimensions, which measure the physical component summary (PCS) and the mental component summary (MCS). The form was translated into German and validated by Billinger et al. [7].

All patients were investigated prior to surgery and 8 months after surgery by an independent examiner (CD and AD).

Statistical analysis

All continuous variables are given as mean and standard deviation, and categorical data as absolute and relative

Table 2 Patients expectation questionnaire includes 15 questions

Expectation		No. of patients	Likert scale				
			1	2	3	4	5
Reduction in pain	Total	102	85	17			
	Responder	54	43	11			
	Non-responder	48	42	6			
Improvement in walking	Total	102	82	20			
	Responder	54	42	12			
	Non-responder	48	40	8			
Walking without crutches	Total	102	58	40	2		2
	Responder	54	32	20	1		1
	Non-responder	48	26	20	1		1
Strength in the leg and knee	Total	102	67	35			
	Responder	54	39	15			
	Non-responder	48	28	20			
Improvement in climbing upstairs	Total	102	55	46	1		
	Responder	54	32	22			
	Non-responder	48	23	24	1		
Improvement in climbing downstairs	Total	102	58	43	1		
	Responder	54	34	20			
	Non-responder	48	24	23	1		
Improvement in kneeling	Total	102	45	44	11	1	1
	Responder	54	26	24	4		
	Non-responder	48	19	20	7	1	1
Improvement in squatting	Total	102	46	41	11	2	2
	Responder	54	26	23	5		
	Non-responder	48	20	18	6	2	2
Improvement in the capability to use public traffic facilities	Total	102	40	45	10		7
	Responder	54	25	23	3		3
	Non-responder	48	15	22	7		4
Improvement in participating leisure activity	Total	102	41	48	11	1	1
	Responder	54	26	22	6		
	Non-responder	48	15	26	5	1	1
Improvement in daily activity	Total	102	52	48	2		
	Responder	54	30	24			
	Non-responder	48	22	24	2		
Sports activity	Total	102	35	46	17	2	2
	Responder	54	21	23	10		
	Non-responder	48	14	23	7	2	2

Table 2 continued

Expectation		No. of patients	Likert scale				
			1	2	3	4	5
Improvement in changing position	Total	102	45	56	1		
	Responder	54	25	29			
	Non-responder	48	20	27	1		
Social integrity	Total	102	31	52	11	1	7
	Responder	54	20	26	3	1	4
	Non-responder	48	11	26	8		3
Improvement in mental well-being	Total	102	50	44	1	2	5
	Responder	54	25	24		1	4
	Non-responder	48	25	20	1	1	1

Five answers were provided and coded using the Likert scale from 1 to 5 (1—very important, 2—important, 3—less important, 4—relevant and 5—not relevant). The distribution of the answers is shown in the table

frequencies. Patients were classified as responders in case of an expectation of 1 or 2 on a Likert scale, calculated as rounded mean of all 15 aspects of patient's expectation questionnaire, and with a satisfaction of 1 or 2 on the Likert scale, calculated as rounded mean of all 15 aspects of patient's satisfaction questionnaire.

Univariate, explorative testing between responders and non-responders was performed using robust t-test (Satterthwhaite) for WOMAC, KSS and SF-36 at baseline (prior to surgery) as well as the improvement versus baseline. Family status, gender distribution and side of surgery were tested using χ^2-test.

To investigate any predictive potential for response based on age, BMI, sex, social status as well as the indication of specific status described by pre-surgery results of WOMAC, KSS and SF-36, all these variables have been evaluated by a stepwise logistic regression procedure (Proc Logistics). The result is reported in terms of sensitivity, specificity and correct classification rate.

All $P < 0.05$ are considered statistically significant for all explorative analyses. All data were analysed using SAS 9.2 (SAS Institute, Cary, NC, USA).

Results

The overall outcome according to the KSS showed significant improvement in both knee score and function score ($P < 0.001$). The knee score improved from 51 ± 13 points prior to surgery to 85 ± 14 points after surgery and the function score from 51 ± 16 points to 78 ± 15 points.

The WOMAC score showed significant improvement in all categories when results prior to surgery were compared with the follow-up results (Table 1).

A total of 54 patients (53%) showed expectation prior to surgery of 1 or 2 and a satisfaction after surgery of 1 or 2 according to the Likert scales. These patients were considered to be responder. The remaining 48 patients (47%) were classified as non-responder.

No difference in patient expectation was observed between responder and non-responder prior to surgery (Table 2). The fulfilment of patient's expectation of the responder and non-responder is shown in Table 3 at the time of follow-up.

A detailed view on the 46 patients (45.1%), who reported an expectation classified as 1 (very important), provided a wide range of satisfaction. Only 10 of these 46 patients (21.7%) reported satisfaction 1, and half of 34 patients reported satisfaction of 2 and 3, respectively (37% per category). Even 2 patients reported a Likert scale value of 4. The improvement in satisfaction went in line with the amount of 'Improvement in limping' and 'Improvement in squatting'. In each case, 71.7% of these 46 patients reported satisfaction regarding pain reduction and an increase in ability to walk. About 65.2% reported satisfaction regarding both 'Improvement in limping' and 'Improvement in squatting'.

No statistically significant difference was detected between responder and non-responder in terms of the parameter sex, family status and side of surgery. Considering the continuous parameters of KSS, SF36 and WOMAC, a few statistically significant differences were found between the responder and non-responder at baseline (pre-surgery) and in differences pre-surgery minus follow-up after surgery (Table 4). Patients identified as responder showed in the knee score of the KSS, in five out of six dimensions of the SF-36 and in the pain as well as function category of the WOMAC significant better results than the non-responder.

Table 3 Patients questionnaire to enquire the fulfilment of patients expectation 8 month after TKA

Fulfilment of patients expectation		No of patients	Likert scale				
			1	2	3	4	5
Reduction in pain	Total	102	44	27	28	2	1
	Responder	54	35	14	5		
	Non-responder	48	9	13	23	2	1
Improvement in walking	Total	102	40	33	25	3	1
	Responder	54	32	18	4		
	Non-responder	48	8	15	21	3	1
Walking without crutches	Total	102	60	18	15	2	7
	Responder	54	39	12	3		
	Non-responder	48	21	6	12	2	7
Strength in the leg and knee	Total	102	29	32	38	1	2
	Responder	54	25	24	5		
	Non-responder	48	4	8	33	1	2
Improvement in climbing upstairs	Total	102	23	39	32	6	2
	Responder	54	23	28	3		
	Non-responder	48		11	29	6	2
Improvement in climbing downstairs	Total	102	21	30	41	8	2
	Responder	54	20	26	7	1	
	Non-responder	48	1	4	34	7	2
Improvement in kneeling	Total	102	4	15	23	33	27
	Responder	54	4	15	15	13	7
	Non-responder	48			8	20	20
Improvement in squatting	Total	102	8	16	31	25	22
	Responder	54	8	15	17	9	5
	Non-responder	48		1	14	16	17
Improvement in the capability to use public traffic facilities	Total	102	29	30	30	2	11
	Responder	54	26	24	4		
	Non-responder	48	3	6	26	2	11
Improvement in participating leisure activity	Total	102	18	32	31	9	12
	Responder	54	18	29	7		
	Non-responder	48		3	24	9	12
Improvement in daily activity	Total	102	24	31	38	7	2
	Responder	54	23	25	8		
	Non-responder	48	1	6	32	7	2
Sports activity	Total	102	16	29	28	17	12
	Responder	54	16	28	6	4	
	Non-responder	48		1	22	13	12
Improvement in changing position	Total	102	23	40	34	1	4
	Responder	54	23	28	3		
	Non-responder	48		12	31	1	4
Social integrity	Total	102	20	34	28	10	10
	Responder	54	20	29	4	1	
	Non-responder	48		5	24	9	10
Improvement in mental well-being	Total	102	31	31	35	3	2
	Responder	54	30	21	3		
	Non-responder	48	1	10	32	3	2

Five answers were provided and coded using the Likert scale from 1 to 5 (1—true, 2—almost true, 3—partially true, 4—rather untrue and 5—not true). The distribution of the answers is shown in the table

Table 4 Means, standard deviations and P-values of all statistically significant test results at baseline (pre-surgery), and tested as improvements versus baseline: parameters of KSS, SF-36 and WOMAC (responders vs. non-responders)

	Score		Responder N = 54	Non-responder N = 48	P-value
KSS	Knee score	Baseline	54.2 ± 13.2	47.8 ± 12.7	0.016
		Improvement versus baseline	35.2 ± 12.6	30.8 ± 22.7	n.s.
	Function score	Baseline	53.5 ± 15.1	47.5 ± 16.5	n.s.
		Improvement versus baseline	30.9 ± 15.7	23.0 ± 21.1	0.037
SF36	Physical functioning	Baseline	32.6 ± 19.2	19.0 ± 15.8	<0,001
		Improvement versus baseline	29.9 ± 24.1	18.9 ± 19.5	0.012
	Physical role	Baseline	22.2 ± 37.5	14.6 ± 30.0	n.s.
		Improvement versus baseline	40.7 ± 46.7	8.3 ± 33.6	<0.001
	Bodily pain	Baseline	28.0 ± 14.3	21.5 ± 13.3	0.019
		Improvement versus baseline	44.2 ± 23.7	26.6 ± 18.3	<0.001
	General health	Baseline	58.2 ± 16.4	39.3 ± 12.5	<0.001
		Improvement versus baseline	5.4 ± 16.9	14.5 ± 14.3	0.004
	Emotional role	Baseline	66.0 ± 45.1	35.4 ± 44.8	0.001
		Improvement versus baseline	16.0 ± 50.9	16.7 ± 55.0	n.s.
	Mental health	Baseline	66.7 ± 19.4	54.1 ± 20.1	0.002
		Improvement versus baseline	12.0 ± 20.0	7.4 ± 19.8	n.s.
	Physical component summary (PCS)	Baseline	47.5 ± 11.9	39.3 ± 13.0	0.001
		Improvement versus baseline	2.5 ± 11.0	3.3 ± 14.6	n.s.
	Mental component summary (MCS)	Baseline	30.3 ± 9.5	27.5 ± 8.6	n.s.
		Improvement versus baseline	14.1 ± 10.7	7.0 ± 9.9	0.001
WOMAC	Pain	Baseline	27.4 ± 9.9	33.6 ± 10.1	0.002
		Improvement versus baseline	22.2 ± 10.6	16.3 ± 9.8	0.004
	Stiffness	Baseline	11.9 ± 5.0	12.5 ± 4.8	n.s.
		Improvement versus baseline	8.5 ± 4.9	4.4 ± 4.7	<0.001
	Function	Baseline	87.6 ± 31.8	113.6 ± 29.5	<0.001
		Improvement versus baseline	67.4 ± 31.6	46.3 ± 32.8	0.001

Significant higher improvement was found in the responder group in the function score of the KSS, in all dimensions of the SF-36 except in the emotional role and mental health and in all categories of the WOMAC.

The physical component summary of the SF-36 was better in the responder compared with the non-responder. However, the improvement versus baseline was not significant different between the responder and non-responder. The mental component summary of the SF-36 showed no difference between the groups prior surgery, but significant more improvement was found in the responder group.

Evaluating the available information prior to surgery, the following predictive potential has been detected:

The parameters general health (SF-36) and role emotional (SF-36) measured prior to surgery dominate the predictive potential to get a responder with sensitivity of 74%, specificity of 81% and a rate of correct classification of 78%.

Discussion

The most important finding of the study was the better clinical outcome according to the KSS, WOMAC and SF-36 in patients with high expectancy prior to surgery and a high fulfilment of their expectancy after TKA than in patients with lower expectation and satisfaction. The prediction in patients outcome after TKA does not rely solely on objective parameter such as knee function and joint stability. The combination of patient's mental and physical well-being determines the outcome after TKA. As already stated by others, patient's assessment requires a complex analysis of joint function, general health and the mental or emotional status [14–16]. The scale 'general health' and 'emotional role' of the SF-36 are one of the best predictive values in the outcome after TKA as shown in the current study. The general health scale is one of the most valid scales in relation to the mental, physical and general health report [32]. Severe pain, low mental health and

co-morbidities are likely to influence the outcome after TKA negatively [9, 11, 26]. Residual pain and dysfunction might not always be related to the knee. As reported by Kim et al., 51% of dissatisfied patients showed unrelated symptoms to the knee after TKA [20].

The emotional role seems to be commonly hidden by the patient when seen by the surgeon. Thus, it is difficult to evaluate patient's emotional role with the current available scoring systems [8]. However, the emotional role reflects patient's problems regarding their profession or other activities of daily living as a result of emotional problems [32]. In case there is no longer tension between the patients whole body and their disabled joint, the patients will be satisfied. Therefore, patients may self-asses their outcome as excellent despite the fact of poorly grading in some of the evaluation systems and the converse results may also occur. Beside the predictive value of the 'emotional role' in the SF-36, other factors such as pre-operative depression and anxiety symptoms show significant impact on the early outcome after surgery. Higher level of pre-operative pain seems to be a predictor for the manipulation of the knee after surgery due to poor range of motion [5]. However, other studies did not find the correlation between pain and lower outcome after TKA as reported by Hawker et al. [16] in a large community-based outcome study.

Responder in our study presented significant better results in the pain category according to the WOMAC prior surgery and in pre- to post-operative improvement. Fortin et al. [13] reported that those patients with worst function and pain prior to surgery showed worse outcome 2 years after surgery. They reported SF-36 physical function score of 37.4 in the higher function group and 14.3 in the lower one similar to our findings (responder 32.6 versus non-responder 19.0). The two other categories such as stiffness and function of the WOMAC showed also significant more improvement in the responder group than in the non-responder group. However, a more significant improvement does not mean that the final outcome will be better. It has been reported by others that the final outcome remains low in patients who complain about more pain and stiffness as well as lower function prior to surgery despite the fact of more significant improvement [12]. Kim et al. [20] reported that worst pre-operative WOMAC pain score and most significant reduction in range of motion were significantly associated with dissatisfaction after surgery. The delay of surgery may cause functional decline due to natural progression in OA. It affects negatively the clinical outcome and seems to be an important aspect for discussion with the patient. Patient's co-morbidity also negatively affects the clinical results, but this finding does not support the assumption to recommend rather early surgery [10, 25]. Several studies have shown that there is no correlation

between the waiting time for surgery and the clinical outcome after TKA [17, 34].

The improvement in satisfaction went in line with the amount of improvement in limping and squatting. Nobel et al. [29] reported also significant better results in squatting in satisfied than in dissatisfied patients. It has been found that satisfied patients exhibit higher performed function in stretching, strengthening exercise, dancing, gardening and moving laterally.

No difference was observed between both groups in terms of patient's expectation regarding the outcome after TKA. However, the fulfilment of patient's expectation and the improvement after surgery according to KSS, WOMAC and SF-36 showed significantly better results in the responder group. Patient's expectation prior to surgery seems to be less relevant for patient's outcome. It has been shown previously that individuals with higher expectations regarding their improvement in pain and function do not differ in the outcome from those with lower expectations after TKA or THA [27]. The outcome in the final follow-up of this study was based on the WOMAC, SF-36 and satisfaction scale. Furthermore, the authors found no correlation between the functional status prior surgery and patient's expectation according to our results. Age, gender, race, marital status or severity of joint disease did not show any impact on the patient's [1]. These findings were confirmed for gender, marital status and site of surgery in the current study. Patients are not more dissatisfied after TKA when they live alone [4]. Interestingly, the health professional support after surgery might also play a role in the health-related quality of life after surgery [2].

The family status of the patients did not show any impact on patient's expectation or satisfaction. The marital status did also not influence the level of expectation regarding the outcome of total hip and knee arthroplasty by Mahomed et al. [27]. According to these findings, the marital status seems to be rather irrelevant parameter in the outcome of TKA. However, there is a 25% increased probability of staying longer in hospital for patients who are living alone [18].

This study has some limitations. Patients were only followed up for a short term. Improvement in the clinical outcome between short-term and longer-term follow-ups was shown by others [21]. Thus, it will be interesting to see how patients will assess the fulfilment of their expectation after a longer-term of follow-up. Furthermore, we did not include the rehabilitation programme as a parameter in our analysis, which may have an impact on the short-term clinical outcome [23].

The study has shown that most of the scales and categories of the SF-36, WOMAC and KSS showed significant improvement after surgery. More improvement in pain and function was seen in patients with higher fulfilment of their
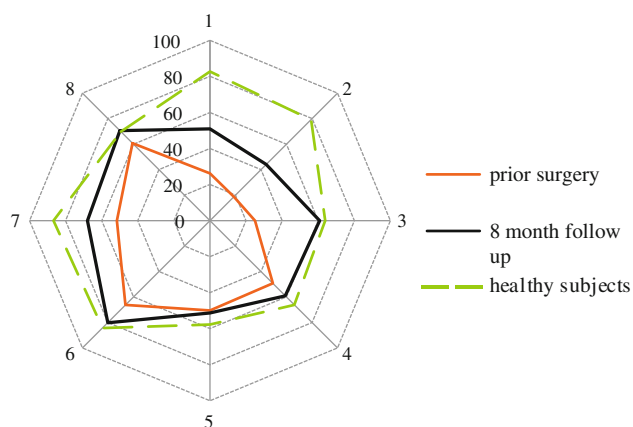
Fig. 1 SF 36 of all patient's prior surgery and at the time of follow-up in comparison with the healthy subjects (1—physical functioning, 2—physical role, 3—bodily pain, 4—general health, 5—vitality, 6—social functioning, 7—emotional role and 8—mental health)
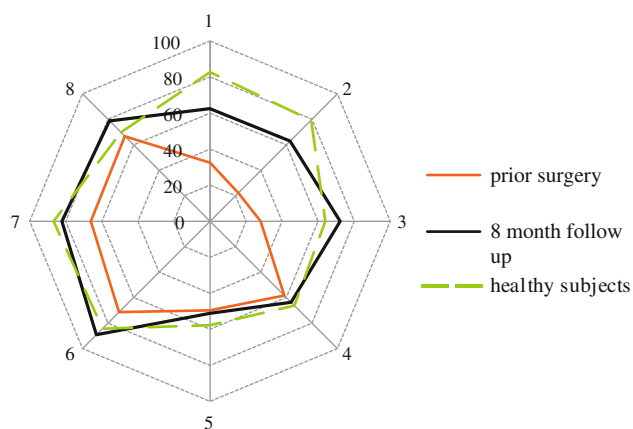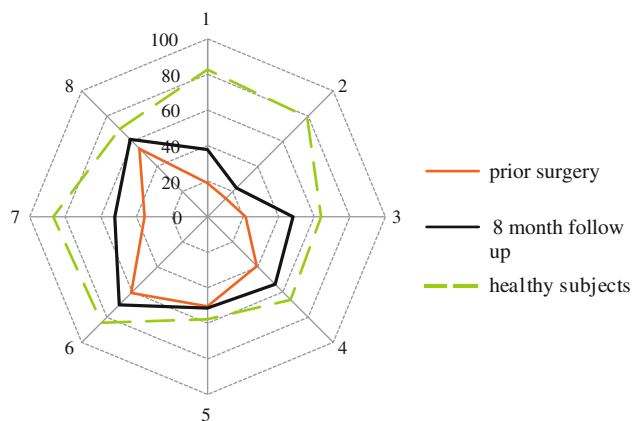

Fig. 2 SF 36 prior surgery and at 8 month of follow-up of the *responder* compared with healthy subjects (1—physical functioning, 2—physical role, 3—bodily pain, 4—general health, 5—vitality, 6—social functioning, 7—emotional role and 8—mental health)

Fig. 3 SF 36 prior surgery and at 8 month of follow-up of the *non-responder* compared with healthy subjects (1—physical functioning, 2—physical role, 3—bodily pain, 4—general health, 5—vitality, 6—social functioning, 7—emotional role and 8—mental health)

expectations after surgery despite comparable expectation regarding the outcome after TKA (see Figs. 1, 2 and 3).

In conclusion, the study has shown that patient satisfaction correlates with the clinical outcome according to the KSS, WOMAC and SF-36. Beside the osteoarthritic knee, which requires TKA, the general health situation and the mental status need to be taken into account. The success of TKA does not rely solely on the operated knee. The three parameters such as general health, emotional role and knee function need to be considered prior surgery in order to discuss with the patient the expected outcome after total knee replacement.

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