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Mental Health as a Predictor for Patient Reported Outcome after a Total Hiparthroplasty - A Prospective Cohort Study

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Abstract

Background: Total hip arthroplasty (THA) is often very successful in patients with severe hip pain and end-stage-osteoarthritis; however a minority of patients has less favorable outcomes.

Aim: To investigate whether patients' preoperative mental health is a predictor for patient-reported outcome (PRO) after THA.

Method: The prospective cohort study included 207 patients over a 14-month period, with two follow-ups. Patients completed the Common Mental Disorders – Screening Questionnaire, Oxford Hip Score, and Euro Qol 5 Dimension questionnaire before surgery and at twelve and 52 weeks after surgery. Data were analysed by multiple linear regression and t-tests.

Results: Significantly improvement outcomes between baseline and postoperative follow-ups were reported. Age, gender and BMI together with EQ-5Dindex showed significant regression coefficients. Older, higher BMI and to by a women were predictor for the worse patient reported outcome (OHS) after twelve weeks. An inferior score on quality of life (EQ-5Dindex) at baseline predict a minor PRO after twelve weeks. After 52 weeks, concern and EQ-5Dvas showed significant regression coefficients of PRO as patient with a high score of concern; scores higher on PRO (OHS) after 52 weeks. Patients with a poorer quality of life measured by EQ-5Dvas were having a higher score at OHS as a worse outcome of surgery.

Conclusion: Concern measured at baseline can predict PRO after 52 weeks while age, gender and BMI are the prime predicts after twelve weeks. The development of patients' mental health, as they undergo a THA from baseline to 52 weeks postoperative, needs further investigating.

Background

Total hip arthroplasty (THA) is among the most common orthopaedic procedures, with the majority of cases showing good or excellent outcome [1-8]. However, some patients have dissatisfactory outcome, which has been associated with factors such as high age, female gender, high BMI, high Charlson Co-morbidity index score, poorer social status, low education level, and low civil status [9-11].

Short Form-36 (SF-36), Western Ontario and McMaster Universities Arthritis Index (WOMAC) and Visual Analogue Scale (VAS) are often used for assessing function and pain related to an operation [9]. In order to assess patients' mental health, the focus primarily has been on Hospital Anxiety and Depression Scale (HADS), SF-36 and other small scales [9], not including patients' mental health according to anxiety, depression, concern, somatoform disorders, alcohol abuse and emotional disorders in the same questionnaire. Assessments based on the level of anxiety and concern, symptoms of depression and somatoform and emotional disorders have already been integrated in primary health care [12,13].

Poor mental health and pain have been shown to influence the outcome of total knee arthroplasty [14], while associations between psychological factors, co-morbidity and patient-reported outcome of hip surgery are uncertain [9,15]

More studies report a high correlation between symptoms such as depression, anxiety and mood; and development of chronic pain [16-20]. Patients suffering from osteoarthritis are in a high risk (one out of five) of having a history of depression or anxiety or both, or being distressed [21-23].

Patients at the end-stage of hip osteoarthritis (OA) are affected by pain, maybe for a long time; and a correlation between pain and this populations' mental health is well-known [16]. Other studies have investigated the correlations between patients´ mental health and the outcome of an operation [9, 24-28], yet with equivocally results.

As far from all patients in the healthcare system achieve the expected relief by surgery [29-31], a more targeted focus on the treatment of patients' mental health could offered if orthopaedic departments were able to identify patients with poor prospects together with the traditional treatment. However, it remains to be shown whether patients' mental health is a predictor for their own report of outcomes and no studies have analysed whether patients' mental health can predict PRO (OHS) by using a mental health scale including anxiety, depression, concern and somatoform disorder, as Common Mental Disorder – Screening Questionnaire (CMD-SQ).

The aim of this study is to investigate whether patients' preoperative mental health can reliably predict patient reported outcomes after THA.

Materials and Methods

The study is designed as a prospective cohort study assessing patient-reported outcome (PRO). The participants were included from October 2010 to December 2011, with follow-up at twelve and 52 weeks. Patients were referred from the general practice.

On their arrival for a Joint Care day before the operation, patients were asked to complete three questionnaires: the Common Mental Disorders – Screening Questionnaire (CMD-SQ) the five dimension EuroQol (EQ-5D) and the Oxford Hip Score (OHS). They are measures of mental health, health-related quality of life and physical health, respectively. Twelve and 52 weeks after the operation, they were asked to answer the same questionnaires. The questionnaires were sent by land mail, to be completed and returned in a stamped and addressed envelope that was enclosed. Reminders were send after 14 days and if this also failed to secure a response the patients were contacted by phone. The study was structured according to the STROBE statement [32].

Population

Inclusion criteria

The study included patient with severe hip pain diagnosed with OA scheduled for THA to the Department of Orthopaedic Surgery at Denmark. For eligibility, participants were required to be able to speak and read Danish and be above 18 years of age.

Exclusion criteria

Patients with primary or secondary bone tumours and patients registered as terminal were excluded. The same applied for patients who had experienced a trauma against the hip within the past four weeks before the visit to the outpatient Department of Orthopaedics, and those diagnosed with a severe mental disorders such as schizophrenia, paranoid psychosis and bipolar affective disorders.

Questionnaires

The 38-item CMD-SQ was originally prepared as a tool for general practitioners to support their focus on patients' mental health, including anxiety, concern and depression. The Danish translation was subsequently validated in tests involving 701 patients [13]. The six subscales of the CMD-SQ have also been validated for use un Danish contexts: the SCL-SOM, Whiteley-7, SCL-ANX4, SCL-8, SCL-DEF6 and CAGE [13]. Responses were rated on a five point Likert scale.

EQ-5D (Euro Qol 5 Dimensions) was designed to measure patients' own assessment of their health-related quality of life, without reference to a specific diagnosis. A translation of the questionnaire has been validated for use in Danish contexts [33].
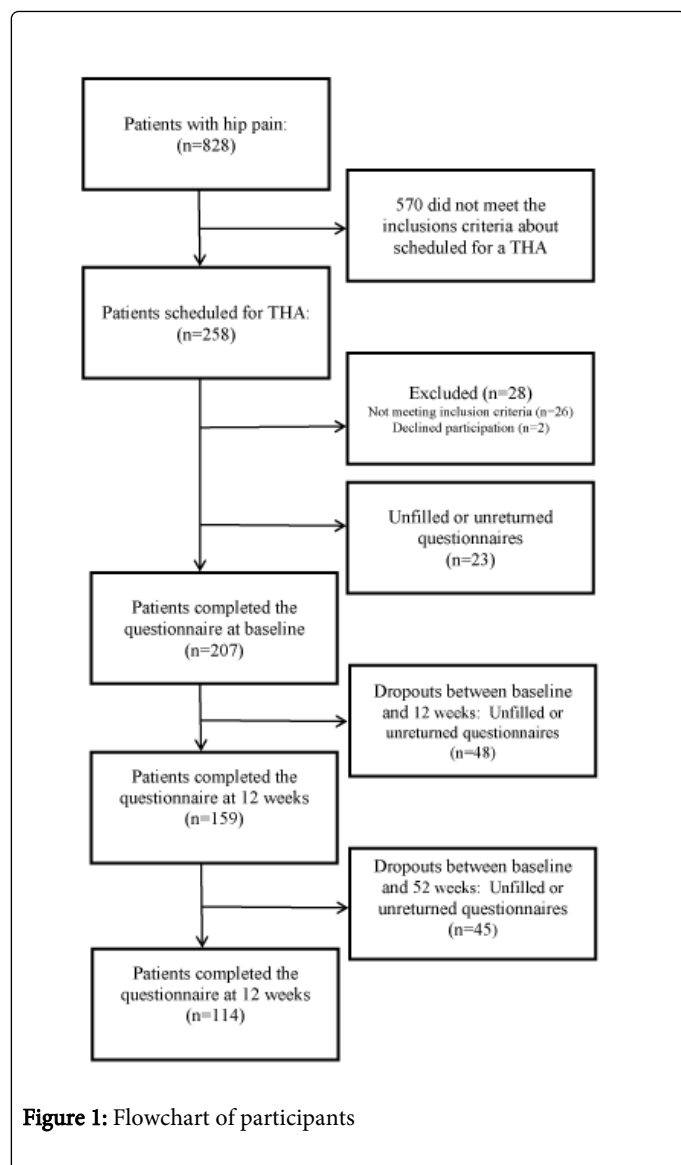
The participants' function and pain at baseline, twelve and 52 weeks postoperatively was assessed by the 12-item OHS questionnaire, compiled and validated at Oxford University Hospital for specific use in relation to THA patients. We used a translated and validated Danish version [34], with participants responding on at five-point Likert scale. Total scores are thus between twelve and 60 points, with low scores reflecting good outcomes and scores above 36 categorised as poor patient-assessed outcome [35].

Sample size

We based the decision to include at least 36 hip patients in our analyses on an adequately powered study showing significant improvement in EQ-5D scores after surgery as no studies were identified using CMD-SQ preoperatively and OHS postoperatively; and EQ-5D is included in questionnaires in this study. The calculation was based on mean of 0.41 with standard divisions (SD) of 0.36 preoperatively and 0.68 SD (0.34) postoperatively [36,37].

Ethics statements

Participants were informed about the study by a project assistant who assured them that non-participation would have no consequences for their treatment. Approval was obtained from the Regional Scientific Ethical Committee of Southern Denmark and the Danish Data Protection Agency (J.nr. 2009-41-3896).

Results

The study included 207 patients with a mean age 69.7 years. Females accounted for 56% of the included patients (Figure 1). At twelve weeks postoperatively 48 patients had not returned a filled questionnaire, and the dropouts were significantly younger with a mean age of 66.5 years (p=<0.01) and they were significantly more depressed than the study participants (p=0.03) (Table 1) at baseline.

Figure 1: Flowchart of participants

Statistical analysis

Baseline data included gender, age, BMI, civil status, education level, co-morbidities, anxiety, concern, depression, somatoform disorders, alcohol abuse, quality of life, OHS, and EQ-5D. The analyses were done by unpaired t-tests. Patients´ mental health score were compared baseline data with postoperative data using t-tests.

To investigate patients' preoperative mental health (assessed by CMD-SQ) as a predictor for postoperative outcome (OHS), we used a multiple linear regression with OHS as the dependent values and patients' mental health at baseline as the independent values (predictors).Data distribution was assessed by QQ-plot and histograms. All missing values were handled as missing.

All statistical analyses were done using Stata (Stata Corp. 2009. Statistical Software: Release 11. College Station, Texas). A p-value <0.05 was chosen as a significance level.

Variables (score)	Baseline outcomes at all participants at baseline	Baseline outcomes on the participants at 12 weeks	Dropouts at 12 weeks .	Baseline outcomes on the participants at 52 weeks	Dropouts at 52 weeks
Descriptive variables	Mean(SD)/n	Mean(SD)/n	p-values	Mean(SD)/n	p-values
Gender	0.56(0.50)/207	0.54(0.49)/157	p=0.52	0.52(0.50)/116	p=0.16
Age	69.7(9.4)/207	70.6(8.6)/157	p<0.01*	70.0(8.7)/116	p=0.53
BMI	28.1(5.8)/197	27.8(5.1)/140	p=0.21	27.6(4.7)/109	p=0.11
Civil Status	1.7(1.2)/189	1.68(1.1)/144	p=0.43	1.6(1.2)/110	p=0.08
Education level	3.1(1.9)/194	3.1(1.9)/150	p=0.50	3.2(1.8)/109	p=0.37
Co-morbidities	0.8(1.1)/207	0.8(1.1)/157	p=0.49	0.8(1.0)/116	p=0.56
CMD-SQ:					
Anxiety1 (0-4)	0.9(1.2)/179	0.9(1.2)/137	p=0.22	0.9(1.1)/102	p=0.84
Concern1 (0-8)	2.3(2.3)/163	2.2(2.3)/124	p=0.87	2.1(2.3)/90	p=0.42
Depression 1 (0-6)	0.7(1.4)/172	0.6(1.3)/133	p=0.03*	0.6(1.2)/97	p=0.21
Somatoform Disorders1 (0-12)	3.2(2.3)/148	3.1(2.2)/109	p=0.45	3.2(2.2)/81	p=0.85
Emotional Disorders1 (0-8)	1.8(2.1)/170	1.7(2.0)/131	p=0.17	1.6(1.9)/95	p=0.32
Alcohol abuse1 (0-4)	0.1(0.4)/166	0.1(0.2)/126	p=0.62	0.2(0.4)/93	p=0.10
Quality of Life1 (5-1)	3.6(1.1)/198	3.6(1.1)/153	p=0.84	3.6(1.1)/113	p=0.43
OHS:					
Total score	36.1(7.0)/174	36.0(6.9)/134	p=0.71	35.8(7.1)/99	p=0.50

(12-60)					
EQ-5D-3L					
EQ-5DIndex (-0.624 – 1)	0.8(0.2)/169	0.8(0.2)/129	p=0.45	0.8(0.2)/95	p=0.13
EQ-5DVAS (0-100)	68.9(17.4)/142	68.4(16.7)/111	p=0.30	68.3(17.8)/68	p=0.62

Table 1: Dropout analyses

Development in metal health and patient-reported outcomes (PRO)

Between baseline and twelve weeks after surgery, we found significantly decreased levels of anxiety, concern and emotional disorders (Table 2). Also OHS, EQ-5Dindex and EQ-5Dvaswere significantly improved at twelve weeks follow up. Between baseline and 52 after surgery we found significantly decreased levels of anxiety, emotional disorders, OHS, EQ-5Dindex andEQ-5Dvas, but no significant changes in concern, depression, somatoform emotional disorders, alcohol abuse and quality of life.

	Baseline	12 weeks postoperative	The differences between baseline and 12 weeks postoperatively	52 weeks	The differences between baseline and 52 weeks postoperatively
	preoperative			postoperative	
Variables					
(score)	**Mean(SD)/n**	**Mean(SD)/n**	**p-values**	**Mean(SD)/n**	**p-values**
CMD-SQ:					
Anxiety1 (0-4)	0.94 (1.2)/179	0.55(0.97)/156	p<0.001*	0.72(1.1)/116	p<0.001*
Concern1 (0-8)	2.3 (2.3)/163	1.4(2.2)/151	p<0.001*	2.0(2.5)/109	p=0.15
Depression1 (0-6)	0.7(1.4)/172	0.7(1.3)/156	p=0.52	0.7(1.3)/112	p=0.61
Somatoform Disorders1 (0-12)	3.2(2.3)/148	3.3(2.7)/141	p=0.73	3.5(3.1)/98	p=0.60
Emotional Disorders1 (0-8)	1.9(2.1)/170	0.5(0.9)/154	p<0.001*	1.5(2.2)/113	p=0.03*
Alcohol abuse1 (0-4)	0.1(0.4)/166	0.1(0.4)/139	p=0.74	0.1(0.5)/104	p=0.98
Quality of Life1 (5-1)	3.6(1.1)/198	3.7(1.0)/156	p=0.62	3.6(1.0)/116	p=0.78
OHS:					
Total score (12-60)	36.1(7.0)/174	24.4(8.7)/150	p<0.001*	19.8(8.8)/112	p<0.001*
EQ-5D-3L					
EQ-5DIndex (-0.624 – 1)	0.8(0.2)/169	0.9(0.1)/149	p<0.001*	0.9(0.1)/118	p<0.001*
EQ-5DVAS (0-100)	68.9(17.4)/142	76.3(15.9)/147	p<0.001*	76.0(19.8)/121	p<0.001*

Table 2: Summary of total sum scores at baseline; 12 and 52 weeks postoperative and the differences between them

Variables	Regression Coefficients (B)/(SE)	p-value	95 % CI (Confidents Intervals)
Anxiety1	-1.1/(2.8)	0.695	-6.8 – 4.6
Concern1	0.7/(0.7)	0.299	-0.7 – 2.1
Depression1	-1.6/(2.0)	0.408	-5.6 – 2.3
Somatoform Disorder1	0.3/(0.7)	0.684	-1.0 – 1.6
Emotional Disorder1	0.5/(2.1)	0.806	-3.7 – 4.7
Alcohol abuse1	5.3/(2.7)	0.054	-0.9 – 10.7
Quality of life1	0.5/(1.4)	0.710	-2.4 – 3.5
EQ-5Dindex2	-19.5/(8.8)	0.033*	-37.3 - -1.7
EQ-5DVAS2	-0.01/(0.1)	0.929	-0.2 – 0.2
BMI	0.7/(0.3)	0.024*	0.1 – 1.3
Age	0.4/(0.2)	0.035*	0.03 - 0.7
Gender	7.0/(2.5)	0.009*	1.8 – 12.1
Civil status	-0.1/(1.0)	0.891	-2.2 – 1.9
Educations level	0.2/(0.6)	0.730	-1.0 – 1.5
Charlsons Co-morbidities	1.3/(1.0)	0.190	-0.7 – 3.3
B0	-9.6/(20.6)	0.644	-51.5 – 32.2

Table 3: The results of OHS by CMD-SQ and EQ-5D, 12 weeks after surgery

Variables	Regression Coefficients (B)/(SE)	p-value	95 % CI (Confidents Intervals)
Anxiety1	-2.6/(3.5)	0.464	-9.7 – 4.6
Concern1	1.8/(0.8)	0.040*	0.1 – 3.6
Depression1	-0.8/(1.2)	0.664	-4.8 – 3.1
Somatoform Disorder1	-0.1/(0.9)	0.928	-1.9 – 1.8
Emotional Disorder1	0.6/(2.3)	0.794	-4.1 – 5.3
Alcohol abuse1	-2.7/(3.1)	0.402	-9.2 – 3.8
Quality of life1	0.6/(1.9)	0.771	-3.4 – 4.4
EQ-5Dindex2	-2.6/(12.3)	0.835	-28.1 – 22.9
EQ-5DVas2	-0.3/(0.1)	0.038*	-0.5 - -0.02
BMI	0.6/(0.4)	0.107	-0.1 – 1.4
Age	0.1/(0.2)	0.661	-0.3 – 0.5
Gender	-4.4/(3.2)	0.178	-11.1 – 2.2
Civil status	1.0/(1.3)	0.470	-1.8 – 3.7
Educations level	0.3/(0.8)	0.720	-1.3 – 1.8
Charlsons Co-morbidities	0.1/(1.2)	0.906	-2.4 – 2.7
B0	16.2/(26.8)	0.551	-39.3 – 71.8

Table 4: The results of OHS by CMD-SQ and EQ-5D, 52 weeks after surgery, 1 CMD-SQ (a higher score implies a worse outcome)2 EQ-5D (a higher score implies a better health status) *p<0.05

Mental health as a predictor for patient reported outcome (PRO)

The EQ-5Dindex predicts patient reported outcome (assessed by OHS) with a factor of -19.5 and a standard error (SE) of 8.8, meaning that each one-point-increase in the OHS scale is followed by a 19.5-times enhanced score on the EQ-5Dindex , as shown in Table 3. The analyses showed gender, age and BMI to be significant predictors for PRO, twelve weeks postoperatively (Table 3), whereas no significant values were found for anxiety, concern, depression, somatoform disorders and emotional disorders. Data from 52 weeks follow up compared with the baseline data by means of the multiple linear regression analysis showed both concern (factor 1.8 - SE 0.8) and EQ-5Dvas (factor of - 0.3 - SE 0.1) to be predictors of PRO (OHS) (Table 4).

Discussion

The aim of this study was to investigate mental health as a predictor for PROs twelve and 52 weeks postoperatively after THA. We found EQ-5Dindex, age, gender and BMI to be significant predictors of patient reported outcome after twelve weeks.

Furthermore, the analyses showed age, gender and BMI to be predictors of PRO twelve weeks after a THA operation, as PRO decreases with increased age, increased BMI and women reporting lower PRO than men. These results are confirmed by several other studies [38-42].

The 52 weeks follow up that concern significantly predict OHS with a factor of 1.8 (SE 0.8) alongside with patients' overall quality of life (factor -0.3 (SE 0.1). Other studies have shown that patients suffering from both pain and concern report poorer PRO, as pain and concern seem to reinforce each other [43-45], and concern can be seen as a natural reaction for handling threats on health and well-being in cases of powerlessness [16]. In our study we found that patients reporting high scores on concern at the baseline report a high OHS outcome 52 weeks after surgery and thus the poorest PRO.

The study participants' score of anxiety, concern, emotional disorders, OHS, EQ-5Dindex and EQ-5Dvas were significantly increased twelve weeks postoperatively indicating a positive impact of the operation on patients' pain, function and mental health. It is well-known that THA has a positive effect on pain and function [46-49] but regarding the effect on patients' mental health, the conclusions are unclear [9]. Our study confirms that patient's mental health is improved twelve weeks after an operation compared to baseline values; but these results are not found 52 weeks postoperatively. Comparative analyses of the means from baseline and 52 weeks postoperative show only minor differences in concern and emotional disorders, thus the significant differences after twelve weeks were lost (Table 2). This may be due to the fact that patients' experience an immediate effect of the operation with a positive spin off on their mental health, but more research is needed to explain this. After 52 weeks, patients' mental health (especially concern and emotional disorders) returned to

baseline levels, indicating that they experience a threat against their health just like before the operation [50,51].

Our study shows that the assessment time can be a confounder. According to our results, we recommend assessments at twelve weeks and 52 weeks after surgery as these periods have been shown to constitute stable periods regarding function and pain [52,53], but in order to fully understand the development of patients' mental health before and after a THA, operation weekly assessments would be necessary. The results regarding patients' concern point out the clinical relevance of this study as these results underscore the need for more attention on patients' concern before and after the operation in order to increase the PRO.

The EQ-5Dindex and EQ-5Dvas both showed high significantly improvements after twelve weeks and 52 weeks, although the EQ-5D may not be sufficiently sensitive for measurement over time as its VAS score relies in a single response and the index uses only five questions to measure highly sensitive and personal conditions [54]. The results obtained by the EQ-5D should be treated with some caution.

Study Limitations

The attrition of participants from 207 at baseline to 114 at the 52-week follow-up indicates a certain limitation of this study. If the dropouts were those who had experienced the worst outcomes of surgery [55], our study may have a selection bias, as the dropouts after twelve weeks are significantly more depressed and younger then the participants in the study. Knowing that, we chose to include the values of depression and age together with gender, BMI and co-morbidity in the multiple linear regressions.

Our primary outcomes were the CMD-SQ subscales anxiety, concern, depression, but we were unable to identify any studies using the instrument for comparison of pre- and post-operative surveys to predict PRO, we opted for a sample size determined by the results of the health-related quality of life, EQ-5D, which indicated that 36 patients would provide sufficient power. In order to calculate the sample size we needed to estimate the influence of mental health on PRO, but the conclusions from earlier studies were not unambiguous [9].

Strength of the study

This prospective cohort study of a well-defined patient group with twelve and 52 weeks follow up where steady state of the function and pain are expected. We only used validated questionnaires as have be used in early international studies, and for the first time we used psychological questionnaire including the anxiety, depression, concern, somatoform disorders, emotional disorder and alcohol abuse to measure the patients' mental health before and after surgery.

Conclusion

We found preoperative concern can predict PRO for function and pain (OHS) 52 weeks after surgery. In order to further investigate with concern as a predictor of PRO, we recommend more research about the development of patients concern from before to after surgery including twelve and 52 weeks postoperatively.

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