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## Preoperative Anxiety and Depression Correlate With Dissatisfaction After Total Knee Arthroplasty

### A Prospective Longitudinal Cohort Study of 186 Patients, With 4-Year Follow-Up

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4 **Preoperative Anxiety and Depression Correlate With Dissatisfaction After Total Knee**  
5 **Arthroplasty: A Prospective Longitudinal Cohort Study of 186 patients, With 4-year**  
6 **Follow-Up.**

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21 **Abstract**

22 **Background:**

23 After more than 4 decades experience of total knee arthroplasty (TKA) there is still a group of  
24 patients who are not satisfied with the outcome. In spite of the improvement of many aspects  
25 around the procedure, for unexplainable reasons patient dissatisfaction is still approximately  
26 the same. We conducted this study to analyse correlations between preoperative psychological  
27 aspects and dissatisfaction after TKA.

28 **Methods:**

29 A total of 186 patients were operated with a primary TKA. Patients filled out the Hospital  
30 Anxiety and Depression Scale, Visual Analogue Pain Scale (0-100) and Knee injury and  
31 Osteoarthritis Outcome Score preoperatively and 4 years postoperatively. Four years  
32 postoperatively the patients also scored their satisfaction degree with the outcome of the  
33 surgery.

34 **Results:**

35 Of 186 patients, 27 (15%) reported that they were dissatisfied or uncertain with the result of  
36 their TKA 4 years postoperatively. Sixteen of those 27 patients had reported anxiety /  
37 depression preoperatively compared to 11 of 159 (7%) in the satisfied or very satisfied  
38 groups. Patients with preoperative anxiety or depression had more than 6 times higher risk to  
39 be dissatisfied compared to patients with no anxiety or depression (p-value < 0.001). Patients  
40 with deep prosthetic infection had 3 times higher risk to be dissatisfied with the operation  
41 outcome (p-value = 0.03). Dissatisfied patients had 1-day longer hospital stay compared to the  
42 satisfied group (p-value < 0.001).

43 **Conclusion:**

44 Preoperative anxiety and/or depression is an import predictor for dissatisfaction after TKA.  
45 Psychological assessment and treatment preoperatively might improve degree of satisfaction.

46

47 **Introduction:**

48 Dissatisfaction after unrevised TKA has historically been between 6% and 14% [1-12] and if  
49 one adds the group uncertain to the dissatisfied group, it can be up to 28% [13]. There are  
50 several explainable reasons of poor outcome after TKA like patella related problems,  
51 infection, stiffness, instability, periprosthetic fracture, tendon rapture, loosening and nerve  
52 injury. Other well-known extra-articular reasons of poor outcome like hip, spine, vascular  
53 disease, or chronic regional pain syndrome might be contributing [14]. There are studies of  
54 joint arthroplasties that suggest that factors not primarily related to structural tissue changes  
55 but rather of psychological nature are involved [13, 15-17]. In our previous study from the  
56 Swedish Knee Arthroplasty Register we found that patients, who were dissatisfied, had  
57 similar performance tests, clinical and radiographic findings as compared with those who  
58 were very satisfied. The patients who reported poor response after TKA were unhappy, as  
59 demonstrated by Visual Analog Pain Scale (VAS) pain and Hospital Anxiety and Depression  
60 scale (HAD), despite the absence of a discernible objective reason for revision [18]. A  
61 limitation of the study was the absence of preoperative data regarding psychological  
62 assessment of patients. Based on this we designed the present study to better analyze  
63 correlations between preoperative psychological factors and dissatisfaction.

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67 **Patients and methods:**

68 A total of 186 consecutive TKA patients having primary osteoarthritis were included. We  
69 excluded patients having bilateral TKA, dementia, or not being able to speak Swedish. The  
70 patients in this study were included in another study regarding the effect of continuous  
71 intraarticular analgesia on pain and rehabilitation after total knee arthroplasty [19]. Total  
72 number of patients included in that original article were 200, and 14 of these patients were  
73 lost during the follow-up period (12 deceased, 2 refused to participate). The patients were  
74 operated on between January 2010 and April 2011. All patients had a standard straight central  
75 skin incision, medial parapatellar arthrotomy, and preparation of femur and tibia according to  
76 the instructions of the prosthesis manufacturer. Patients received either the cruciate retaining  
77 Triathlon knee (Stryker, United Kingdom) in 151 patients or the cruciate retaining PFC knee  
78 (DePuy, United Kingdom) in 35 patients, depending on the surgeon's preference. Five  
79 orthopedic surgeons who were subspecialized in arthroplasty performed the surgeries. Spinal  
80 anaesthesia was used as a standard method (87%), while the remaining patients received  
81 general anaesthesia. Premedication and postoperative analgesia were standardized. Patients  
82 filled out the HAD [20], VAS pain (0–100 mm, where 0 = no pain and 100 = intolerable  
83 pain), Knee injury and Osteoarthritis Outcome Score (KOOS) questionnaire (0-100, where 0  
84 = major problem and 100 = no problem) [21], and pain drawing with predefined body region  
85 to identify patients with chronic widespread pain [22] preoperatively, and 4 years  
86 postoperatively. Four years postoperatively patients also filled out their satisfaction degree  
87 regarding the operated knee as very satisfied, satisfied, uncertain or dissatisfied [10]. For  
88 statistical analysis reasons, we merged the satisfaction degree data to 2 groups: satisfied (very  
89 satisfied and satisfied groups) and not satisfied (uncertain and dissatisfied groups). Active  
90 range of motion (ROM) of the knee (goniometry) was measured preoperatively; VAS pain,  
91 analgesic consumption, and wound-healing complications were also recorded. Preoperative

92 radiographic assessment was done according to Kellgren and Lawrence system for  
93 classification of osteoarthritis. The patient's files regarding complications and reoperation  
94 were checked 4 years postoperatively in a complications registry and patient files.

95

#### 96 **Statistics:**

97 A Cox multiple regression analysis with constant follow up and robust variance estimation  
98 [23] was used to study relative risks for categorical variables among the dissatisfied group.  
99 Regarding continuous variables, like the mean difference between 2 groups, they were  
100 analyzed by the analysis of covariance method. In both methods, patients' gender, age and  
101 body mass index preoperatively and at 4 years postoperatively were included. A p-value of <  
102 0.05 was considered to be statistically significant. A power analysis had been performed for  
103 the original article [19], which estimated that 200 patients were sufficient to find differences  
104 between the 2 groups for that study, and our statistician considered it to be valid also for the  
105 outcome in this study. Statistical analyses were performed using the Stata 12.0 program.

#### 106 **Ethics:**

107 The study and study registration was performed in compliance with the Helsinki Declaration,  
108 and all patients had given their informed written consent. The ethics committee of the Faculty  
109 of Medicine, Lund University, approved the study (Dnr 2009/368). This is the same  
110 approvement number as the original study about continuous intraarticular analgesia [19].

111

112

#### 113 **Results:**

114 Patient characteristics and the overall result are shown in table 1-3. A total of 27 of the 186  
115 patients (15%) reported that they were not satisfied (uncertain or dissatisfied) with the result  
116 of their TKA 4 years after surgery. A total of 16 of those 27 patients reported anxiety and/or  
117 depression according to the HAD score compared with 11 of 159 (7%) in the satisfied group  
118 (satisfied and very satisfied) at the 4-year follow-up. As shown in table 2, we found that the  
119 patients who preoperatively had anxiety/depression had more than 6 times higher risk to be  
120 dissatisfied after TKA as compared with patients without preoperative anxiety/depression.  
121 Mean length of stay in hospital at the time of surgery for the group that was dissatisfied at 4-  
122 year follow-up was 1 day more as compared with the satisfied group. Patients who had a  
123 postoperative deep infection had 3 times higher risk to be dissatisfied 4 years after TKA while  
124 superficial infection or stiffness as well as preoperative radiographic mild osteoarthritis and  
125 chronic widespread pain did not have any higher risk of dissatisfaction 4 years  
126 postoperatively. All KOOS 5 subscales were significantly improved in both groups.

### 127 **Discussion:**

128 We found in this study that preoperative psychological distress had a significant correlation  
129 with patient dissatisfaction 4 years after TKA. In fact, psychological distress, defined as  
130 anxiety and/or depression, had the strongest statistical correlation with dissatisfaction 4 years  
131 after TKA of all variables studied. The presence of radiographic grade 1 or 2 osteoarthritis  
132 according to the Kellgren and Lawrence classification did not correlate with dissatisfaction.  
133 Longer postoperative hospital stay correlated as well with dissatisfaction, which could be  
134 explained as patients with anxiety/depression might feel safer in the hospital and are maybe  
135 more afraid of going home early. In our hospital, length of stay is standardized to large extent,  
136 and patients with preoperative higher risks or major postoperative complications are  
137 frequently performed or moved to our larger university emergency hospital. Another reason

138 for longer hospital stay is postoperative complications, but it is unlikely that the anxiety  
139 and/or depression group is more prone to general postoperative complications.

140 A limitation of this study is lack of clinical examination, performance tests, and radiographic  
141 examination at the 4-year follow-up. However, in our previous study, we could not find  
142 differences between dissatisfied and very satisfied patients regarding these subjects [18].

143 Another limitation in this study could be the use of 2 different types of prosthesis, and that 5  
144 different surgeons were involved. On the other hand, this might be advantageous to generalize  
145 the result. In addition, all surgeons in our study have nearly equal TKA outcome according to  
146 our local registry.

147 An important reason for dissatisfaction after TKA is pain and poor knee function, and there  
148 are several well-known explanations for these symptoms such as patella-related problems,  
149 infection, stiffness, loosening, instability, fracture, tendon rupture, neurovascular injuries. In  
150 Sweden, the 4 most common (more than 85%) reasons for primary TKA revisions of patients  
151 with osteoarthritis during the period 2004-2013 were infection, loosening, patella-related  
152 problems and instability [24].

153 Since the introduction of TKA there has been a continuous refinement in many of the aspects  
154 of the surgery, including navigation, prosthesis design, preoperative templating, pain  
155 management and infection prophylaxis. Despite these improvements the proportion of  
156 dissatisfied patient is still relatively high (8%-28%) [13]. Khatib et al [13] reported in a  
157 systematic review article of 19 studies that preoperative psychological status may affect the  
158 outcome of TKA. However, the follow-up time was 1 year or less in 16 of the 19 studies  
159 which is a relatively short follow-up time. Bonnin et al [15] reported in a review article of 10  
160 studies that factors associated with a painful knee after TKA were preoperative anxiety /  
161 depression, female gender and age less than 60 years. We presented our results as both crude



162 and adjusted to age, gender and body mass index. In a review article of 10 TKA cohort studies  
163 Paulsen et al. found a correlation between preoperative distress and functional outcome in 6  
164 studies while 4 did not [16]. Several studies have shown correlation between preoperative  
165 psychological distress and poor surgical outcome after TKA [1, 25-32]. Most of these studies  
166 had either fewer patients, or shorter follow-up times compared with our study. On the other  
167 hand, there are studies showing no correlation between preoperative psychological distress  
168 and surgical outcomes [33-36]. Valdes et al [37] found that patients with lower preoperative  
169 radiographic scores and depression reported higher postoperative pain score. We found,  
170 however, no correlation between the radiographic degree of OA and dissatisfaction. Dápuzzo  
171 et al. [38] found that fibromyalgia patients after TKA had more complications and higher  
172 incidence of remaining pain, but despite this, most patients felt satisfied with the procedure.  
173 We did not find that patients with chronic widespread pain had higher risk of being  
174 dissatisfied after TKA. Matsuda et al [39] found a negative correlation between satisfaction  
175 and limited ROM. On the other hand Devers et al. [40] found no correlation between knee  
176 flexion and satisfaction. Interestingly, in our study, all KOOS 5 subscales were significantly  
177 improved at 4 years postoperatively, including the dissatisfied group, even though patients  
178 reported being dissatisfied with the surgical outcome (Figure 1).

179

180 In summary, our results confirm the strong correlation between preoperative anxiety and  
181 depression and later dissatisfaction of the surgical outcome. Psychological assessment and  
182 treatment preoperatively might improve degree of satisfaction for TKA patients.

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187 cooperation. Ali collected and analyzed the data and prepared the manuscript. All the authors  
188 designed the study and helped in writing the manuscript. Ali, Flivik, and Sundberg recruited  
189 patients and performed the operations.

190

191 **Table 1:**  
 192 Patient characteristic

	<b>Not Satisfied (n = 27)</b>	<b>Satisfied (n = 159)</b>
Age, y <sup>a</sup>	72 (8)	73 (10)
Sex, F/M	16/11	104/55
BMI <sup>a</sup>	30 (5)	30 (5)
ASA 1/2/3	7/17/3	34/108/17
Charnley A/B/C	7/5/15	49/48/62
Anesthesia spinal/general	23 / 4	139 / 20
LOS <sup>a</sup> , d	5 (1)	4 (1)
ROM <sup>a</sup> preop	109 (9)	113 (14)
K&L grade 1-2	9/27	37/159
Chronic widespread pain preop.	7/27	21/159
Chronic widespread pain 4y	14/27	26/159
VAS <sup>a</sup> pain preop.	65 (12)	60 (16)
VAS <sup>a</sup> pain 4 y.	56 (18)	11 (10)
Anxiety/depression preop.	14/27	12/159
Anxiety/depression 4y	16/27	11/159
Deep infection	2/27	3/159
Superficial infection	2/27	4/159
Stiffness (flexion < 90 degree)	2/27	7/159

193 BMI, body mass index;LOS, length of stay in hospital; K&L, Kellgren and Lawrence; VAS,  
 194 Visual Analog Pain Scale; ROM, range of motion; ASA, American Society of  
 195 Anaesthesiologists Physical Status Classification.  
 196 <sup>a</sup> mean value, standard deviation in brackets  
 197

198 **Table 2.**

199 Crude estimates, Relative Risk (RR) for dissatisfaction.

<b>Factor</b>	<b>RR</b>	<b>95% CI</b>	<b>P Value</b>
Age	0.98	0.94-1.03	.5
Gender	0.80	0.39-1.63	.5
BMI	1.04	0.97-1.11	.3
Deep infection	2.90	0.93-9.04	.07
Superficial infection	2.40	0.73-7.91	.2
Stiffness (flexion < 90 °)	1.57	0.44-5.66	.5
K&L grade 1-2	0.66	0.32-1.36	.3
ASA	0.89	0.47-1.71	.7
LOS	1.56	1.34-1.82	<.001
Chronic widespread pain preop.	1.37	0.87-2.14	.2
VAS pain preop.	1.02	1.00-1.05	.07
ROM preop.	0.98	0.96-1.00	.08
Anxiety/depression preop.	6.63	3.52-12.49	<.001
KOOS Pain preop.	0.99	0.97-1.01	.6
KOOS Symptoms preop.	0.99	0.96-1.01	.2
KOOS ADL preop.	0.99	0.97-1.01	.2
KOOS Sport/Rec preop.	0.99	0.97-1.02	.4
KOOS QOL preop.	0.99	0.97-1.02	.6

200 CI, confidence interval; BMI, body mass index; K&L, Kellgren and Lawrence; LOS, length of  
 201 stay in hospital; VAS, Visual Analog Pain Scale; ROM, range of motion; ASA, American  
 202 Society of Anaesthesiologists Physical Status Classification; KOOS, Knee Injury and  
 203 Osteoarthritis Outcome Score; ADL, activity of daily living; QOL, quality of life.

204

205

206 **Table 3:**  
 207 Relative Risk (RR) for dissatisfaction adjusted for differences in age,  
 208 gender and BMI

<b>Factor</b>	<b>RR</b>	<b>95% CI</b>	<b>P Value</b>
Deep infection	3.1	1.1-8.4	.03
Superficial infection	2.3	0.78-6.6	.1
Stiffness (flexion < 90 °)	1.6	0.43-6.2	.5
K&L grade 1-2	0.70	0.33-1.5	.4
ASA	0.85	0.42-1.7	.6
LOS	1.6	1.3–2.0	<.001
Chronic widespread pain preop.	1.4	0.90-2.3	.1
VAS pain preop.	1.02	1.00-1.05	.1
ROM preop.	0.98	0.96-1.00	.08
Anxiety/depression preop.	6.5	3.5-12	<.001
KOOS Pain preop.	1.00	0.98-1.02	.8
KOOS Symptoms preop.	0.99	0.96-1.01	.2
KOOS ADL preop.	0.99	0.97-1.01	.3
KOOS Sport/Rec preop.	0.99	0.96-1.02	.5
KOOS QOL preop.	1.00	0.97-1.02	.8

209 CI, confidence interval; BMI, body mass index; K&L, Kellgren and Lawrence; LOS, length of  
 210 stay in hospital; VAS, Visual Analog Pain Scale; ROM, range of motion; ASA, American  
 211 Society of Anaesthesiologists Physical Status Classification; KOOS, Knee Injury and  
 212 Osteoarthritis Outcome Score; ADL, activity of daily living; QOL, quality of life.

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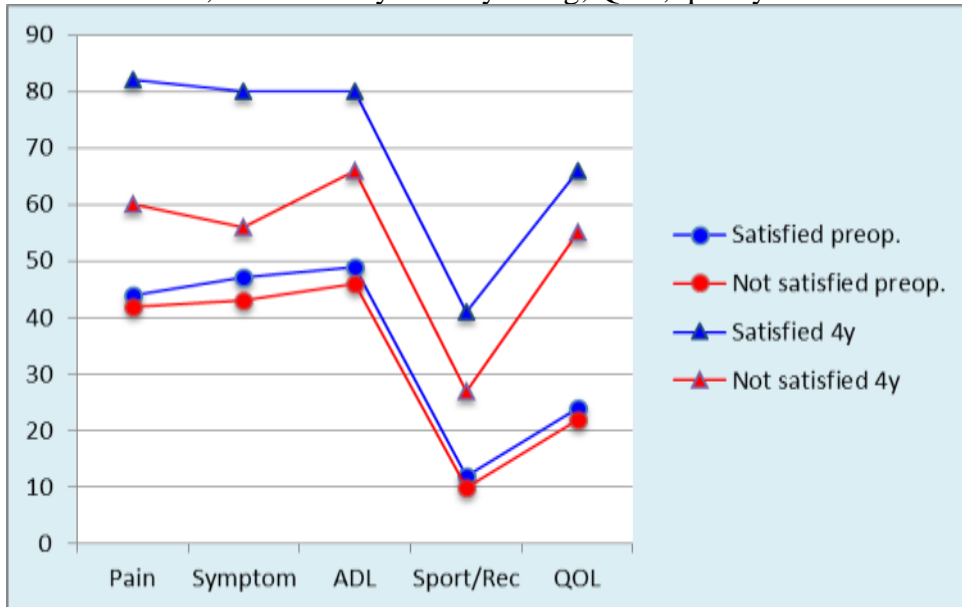
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**Figure: 1**  
KOOS 5 subscales preop. and 4 years postoperative. KOOS, Knee Injury and Osteoarthritis Outcome Score; ADL activity of daily living; QOL, quality of life.



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