Psychiatr. Pol. 2014; 48(5):1025–1034
PL ISSN 0033-2674
www.psychiatriapolska.pl

A knee clinical state affects the preoperative level of anxiety in patients undergoing knee arthroplasty – preliminary report

Paweł Ziętek[1], Joanna Ziętek[2], Karina Szczypiór[1], Łukasz Kołodziej[1], Daniel Kotrych[1], Andrzej Bohatyrewicz[1]

[1] Department of Orthopedics and Traumatology PUM in Szczecin
Head: prof. dr hab. n. med. A. Bohatyrewicz

[2] Psychiatric Center, SPS Health Care "Zdroje" in Szczecin
Head: dr D. Spertusiak-Rogoza

Summary

Aim. The aim of this study was to evaluate whether intensity of state anxiety before operation depends on knee function.

Material and method. The study was conducted among 81 patients qualified to knee arthroplasty because of severe arthrosis. A knee function was evaluated with Knee Society score and Oxford questionnaires, and level of anxiety – with State-Trait Anxiety Inventory by C.D. Spielberger a day before the operation.

Results. Patients with higher intensity of trait anxiety had higher level of state anxiety before operation. To a group with higher intensity of trait anxiety belonged above all elderly persons. In addition, in these patients the knee function was worse. It was indicated that the better knee state and knee function were, the higher level of state anxiety before operation was.

Conclusions. The knee clinical state prior to knee arthroplasty and trait anxiety are the predictors of the preoperative state anxiety. In the group of patients undergoing knee arthroplasty trait anxiety levels were found to be higher in older persons. Before the operation worse clinical knee state was found in patients with primary education as compared to patients with secondary education and university degree. No statistically significant correlation were found between preoperative anxiety and gender, patient's work status and marital status.

Key words: anxiety, knee arthroplasty, predictor

Introduction

Among all the negative emotions (such as anger, irritation) in patients undergoing a major operations, anxiety is a predictor of postoperative pain intensity [1, 2]. Alleviating preoperative anxiety as assessed with objective measures (lower levels of cortisol in urine, lower systolic blood pressure levels during the surgery) has been

found to contribute to postoperative pain relief in patients undergoing surgery [3]. Hence, the negative consequences of preoperative anxiety on the one hand, and its common occurrence before surgery on the other hand [4], induce seeking and recognize another factors increasing preoperative anxiety.

The efforts to alleviate effectively preoperative anxiety are therefore justified, as are the attempts to identify the factors affecting preoperative anxiety levels.

In this study a hypothesis is formulated that anxiety levels before operation are affected by the preoperative knee function. Validation of the hypothesis would be of clinical significance as it would enable estimation of the risk of higher preoperative anxiety levels in patients undergoing surgery based on the assessment of their knee functions.

The aim of this study is to assess whether preoperative state anxiety level is determined by the patient's knee function.

Material and methods

Among 100 patients prospectively surveyed, we analysed 81 patients undergoing fast-track total knee arthroplasty due to knee osteoarthritis III^0 and IV^0 according to Kellgren-Lawrence classification [5] between January and June 2013. All the patients were given equal anaesthesia and analgesia. A Triathlon prosthesis (Stryker, Malwah, New Jersey) was implanted to all patients. 17 patients were excluded from the study for the following reasons: failure to provide written consent to participate in the programme, neurological abnormalities, systemic diseases, alcoholism, and prior major knee surgeries. Two more patients who had improperly filled in their anxiety assessment questionnaires were excluded from further data analysis.

From among 81 persons participated in the study, there were 55 females (68%) and 26 males (32%). The average age was 68 (69 and 66 for females and males, respectively). The youngest patient undergoing operation was 41 years old and the oldest 83. 64% of patients were undergoing their first arthroplasty whereas the rest of the group had already had a knee or hip replaced (27% and 9%, respectively). The average stay in hospital was three days, counting from the surgery day. Two weeks before the surgery the patients were informed about the details of the operation and the following 2-3-day postoperative hospitalisation. On the admission day, all the patients had their knees examined and assessed by the same doctor, with the use of the Knee Society Score (KSS) [6] and the Oxford Knee Score [7]. The KSS score is based on the dimensions of pain, stability, and range of motion and ranges from zero (worst) to 100 (best). A separate Knee Society score for function also ranges from zero (worst) to 100 (best) and consists of questions on ability to walk (in terms of distance), the ability to walk up and down stairs, and the use of walking aids (such as forearm crutches or walkers). The Oxford Knee Score comprises twelve questions concerning the knee state and function in everyday life. Each answer is scored from 1 to 5. The final result ranges from 0 (worst) to 60 (best). The anxiety level was assessed on the day before the operation using a psychometric test – the Polish State-Trait Anxiety Inventory, which is an adaptation of the American State-Trait Anxiety Inventory (STAI) [8].

The questionnaire consists of a number of questions referring to two forms of anxiety – anxiety as a permanent personal characteristic, expressed in the tendency to react with anxiety to certain situations (trait anxiety) and anxiety as a temporary emotional state (state anxiety). The latter type is very sensitive to the impact of a variety of threats (such as a surgery).

Demographic data, including gender, age, BMI, level of education and type of household (single-person or non-single-person household), was obtained prior to the surgery. The level of education was classified into three categories: primary, secondary and higher education.

Following the surgery, all the patients were discharged from hospital as soon as all of the following functional criteria as defined by Husted [9] had been fulfilled: the patients were independent, able to walk with crutches or without, able to get in and out of bed and into and up from a chair; they underwent a sufficient pain treatment; they accepted the discharge.

Permission of the Ethics Committee was obtained for conducting the research study. All the patients gave written consent to participate in the programme.

Data were analyzed with the Statistica software program, Version 10.0 (StatSoft Inc., USA). Statistical analysis was performed using the dependent- and independent-sample t-test, one-way ANOVA and the Pearson correlation coefficient. For the purposes of group comparisons also post hoc tests – LSD and Dunnett's T3 – were used.

Results

In examined patients the anxiety levels and knee function scores are presented in table 1. Results depending on gender are presented in table 2.

A knee clinical state affects the preoperative level of anxiety in patients undergoing knee arthroplasty. Preliminary report.

Table 1. **State anxiety and function tests of the knees in operated patients.**

Characteristic	N	Mean	SD	Standard error	95% Confidence Interval of the Difference	
					lower	upper
state anxiety	81	5.7	1.89	0.21	5.29	6.12
trait anxiety	81	4.4	2.01	0.22	3.99	4.89
KSS	81	57.5	16.84	1.87	53.78	61.23
KSS function	81	51.5	18.56	2.06	47.38	55.59
Oxford knee score	81	18.4	7.2	0.80	16.75	19.94

SD: standard deviation, N: number of patients

In Pearson correlation analysis patients with higher trait anxiety levels were found to show higher levels of preoperative state anxiety ($r=0,59$, $p<0.01$). The group with higher trait anxiety levels comprised mostly people above 65 years of age. In this group of patients (N=37) average state and trait anxiety level was 6,2 (SD=2,09) and 4,7 (SD=1,87), respectively, and in patients 65 years old and younger (N=44) – 5,5

(SD=2,1) and 3,8 (SD=1,9), respectively. Moreover, the knee function in older patients was assessed as worse ($p<0.05$).

In order to check any existence of differences of knee function (as measured with the Oxford Knee Score) depending on education, the one-factor analysis of variance (Anova) was performed. The result proved to be statistically significant $F(3,77)=6,73$, $p<0,05$. With the use of NIR test the differences between the three examined groups were demonstrated ($r=0,26$, $p<0,05$); before the operation, worse clinical knee state (as measured with the Oxford Knee Score) was found in patients with primary education ($M = 12.25$, $SD = 6.89$) as compared to patients with secondary and higher education ($M = 19.25$, $SD = 6.88$ and $M = 23.67$, $SD = 6.36$, respectively), $p< 0.05$. However, gender, patient's work status and the marital status were not found to be statistically significant factors determining anxiety levels (table 2 and 3). The results of "divorce" group were not taken into account because of the only one observation on it.

A knee clinical state affects the preoperative level of anxiety in patients undergoing knee arthroplasty. Preliminary report.

Table 2. **Anxiety and values of clinical tests of the knees in operated patients in relation to sex.**

Characteristic	Sex	N	Mean	SD
KSS	woman	55	58.6	16.91
	man	26	55.2	16.76
KSS function	woman	55	50.8	18.40
	man	26	52.9	19.19
Oxford knee score	woman	55	17.6	7.08
	man	26	20.0	7.28
State anxiety	woman	55	5.7	1.88
	man	26	5.7	1.96
Trait anxiety	woman	55	4.5	1.90
	man	26	4.3	2.25

SD: standard deviation, N: number of patients

A knee clinical state affects the preoperative level of anxiety in patients undergoing knee arthroplasty. Preliminary report.

Table 3. **Relationships between state anxiety, working status and marital status of patients.**

Anxiety		N	Mean	SD
Work				
State	yes	11	6.2	1.72
	no	70	5.6	1.92
Trait	yes	11	3.7	1.19
	no	70	4.6	2.1

table continued on the next page

State	Marital status marriage	54	5.8	1.73
	divorce	1	5.0	
	separation	2	3.5	2.12
	widowhood	24	5.7	2.22
	Total	81	5.7	1.89
Trait	marriage	54	4.3	1.9
	divorce	1	1.0	
	separation	2	3.5	3.54
	widowhood	24	5.0	2.05
	Total	81	4.4	2.01

SD: standard deviation, N: number of patients

In the Pearson correlation analysis it was found that the better the patient's preoperative clinical knee state and function (as measured with the KSS), the higher state anxiety prior to the operation ($r=0,25$, $p<0.05$) (table 4). Hierarchical multiple-regression-analyses were done to check-out if the preoperative anxiety may be explained by such predictors as trait anxiety, knee clinical state (KSS), knee function (KSS function and Oxford), age and gender. A statistical significance was obtained for all models (Table 5).

A knee clinical state affects the preoperative level of anxiety in patients undergoing knee arthroplasty. Preliminary report.

Table 4. **Correlations between anxiety and clinical state and function of the knee in KSS.**

		KSS	KSS function
State anxiety	Pearson's correlation	0.25*	0.05
	significance (2-tailed)	0.03	0.69
	N	81	81
Trait anxiety	Pearson's correlation	-0.04	-0.07
	significance (2-tailed)	0.71	0.56
	N	81	81

* Correlation is significant on 0.05, N: number of patients

A knee clinical state affects the preoperative level of anxiety in patients undergoing knee arthroplasty. Preliminary report.

Table 5. **The results of hierarchical regression analysis for the dependent variable – preoperative state anxiety**

MODEL	Predictors	B	Beta	t-Student	Statistics for the entire model
1	trait anxiety	0,55	0,59	6,43*	R2 = 0,34, F(1,79) = 41,32*
2	trait anxiety	0,56	0,60	6,90*	R2 = 0,42, F(2,78) = 27,82*
	KSS	0,03	0,27	3,12*	
3	trait anxiety	0,56	0,60	6,86*	R2 = 0,42, F(3,77) = 18,35*
	KSS	0,03	0,27	2,96*	
	KSS function	0,00	0,02	0,26	
4	trait anxiety	0,57	0,60	6,74*	R2 = 0,42, F(4,76) = 13,58*
	KSS	0,03	0,26	2,85*	
	KSS function	0,00	0,02	0,18	
	Oxford	0,00	0,01	0,09	
5	trait anxiety	0,60	0,64	7,11*	R2 = 0,44, F(5,75) = 11,96*
	KSS	0,03	0,26	2,91*	
	KSS function	0,00	-0,04	-0,38	
	Oxford	0,01	0,04	0,37	
	age	-0,04	-0,18	-1,90	
6	trait anxiety	0,60	0,64	7,06*	R2 = 0,44, F(6,74) = 9,84*
	KSS	0,03	0,27	2,88*	
	KSS function	0,00	-0,04	-0,36	
	Oxford	0,01	0,04	0,33	
	age	-0,04	-0,17	-1,83	
	sex	-0,05	-0,01	-0,14	

* $p < 0,05$, B-coefficient for predictor, R2 coefficient of determination

Discussion

Hip and knee osteoarthritis are the most frequent reasons for joint replacement [10]. Arthroplasty of big joints is a surgical procedure performed widely all over the world: the United States alone report approximately 808,000 of primary hip and knee arthroplasties annually [11], and the figures show a strong upward trend [12]. As a result, the progress in the techniques of implantation and development of new generations of implants is very rapid. Nevertheless, next to perfecting the equipment and surgical techniques, the psychological condition of a patient undergoing an operation is an es-

sential element of the treatment [13]. Each medical procedure raises uncertainty and preoperative anxiety, which have a negative impact on the patient's psychological recovery and his postoperative rehabilitation [14]. The lower preoperative anxiety level, the faster recovery from postoperative pain [15]. A higher anxiety level is also positively correlated with the tendency to take larger doses of opioids following a knee arthroplasty [16].

Bonnin et al [17] found that next to above-average anxiety levels or depression, other factors predisposing a patient to chronic pain following a knee arthroplasty were also female gender and younger age at the moment of operation. The most recent studies by Singh et al [18] and Hirschmann et al [19] explore the negative impact of anxiety on the postoperative chronic pain following a knee arthroplasty.

In patients participating in our study no differences in anxiety levels were observed between female and male patients. We found, however, that trait anxiety and knee function were correlated with age positively and negatively, respectively. Other studies, in turn, revealed a negative correlation between age and state anxiety [20]. In our study we do not describe any correlation between preoperative anxiety and pain and outcomes after operation, because we did concentrate ourselves on the correlation between knee function and anxiety before operation. However, in a discussion we consciously mention about clinical implications of preoperative anxiety in postoperative period to pay attention on importance of preoperative anxiety in patients undergoing arthroplasty.

Although intense research is conducted on the genetic predisposition to anxiety, it is known that anxiety is also determined by the patient's psychological condition and his or her personality structure [21]. External factors, life difficulties or health condition all affect the patient's psychological condition. In our patients preoperative state anxiety was significantly dependent on trait anxiety. After multiple-regression-analyses, in first model (table 5) trait anxiety explains 34% of variances of state anxiety, and the correlation is moderate. Next models show that trait anxiety is statistically significant predictor of state anxiety (β=0,64, t=7,06, p<0,05). This association was especially visible in patients above 65 years old, in which the trait anxiety was higher than in younger patients. In the light of our studies this group of age may be particularly predisposed to appear the negative preoperative anxiety consequences, of which we mention in a discussion. In our study, we also found that the level of state anxiety was increasing with the patient's better clinical knee state. In multiple-regression-analyses a knee clinical state also turned out to be a significant predictor of state anxiety (β=0,27, t=2,88, p<0,05). It may be explained with the fact that patients with better knee state (measured by physician with objective KSS test) are more afraid of losing the current knee function than patients with a worse knee state. A lack of statistical correlation between anxiety and subjective assessment performed by patient (Oxford, KSS function) can be a result of not always precise answers which did not fully reflect a real knee state. Higher anxiety levels in patients with a better knee function may also be linked with higher expectations of the surgery. However, trait anxiety is better state anxiety predictor than knee clinical state. The other predictors are no significant for anticipate state anxiety.

To our knowledge, ours is the first Polish study revealing the relationship between preoperative anxiety and the knee function. The clinical significance of identifying this relationship is the more valuable for describing a psychological factor related to an objective assessment of the knee function score. Other authors identified correlations between psychological factors and a patient's subjective self-evaluation of a skin or digestive disease [22] or another state – e.g. postpartum period [23].

Ours is a preliminary study and it has certain limitations. Firstly, the control group is relatively small. Secondly, the patients treated in an academic centre may differ from patients of other hospitals in terms of anxiety levels. Thirdly, patients awaiting a knee arthroplasty were not examined by a psychiatrist who could diagnose any existing anxiety disorders in at least some of the patients.

The study reveals the importance of the presence of a psychologist in a surgical department. The availability of psychological support to patients prior to and following a surgery might be another beneficial factor affecting the final results of treatment for patients undergoing arthroplasty of big joints.

Conclusions

1. The knee clinical state prior to knee arthroplasty and trait anxiety are the predictors of the preoperative state anxiety.
2. In the group of patients undergoing knee arthroplasty trait anxiety levels were found to be higher in older people.
3. Before the operation worse clinical knee state was found in patients with primary education as compared to patients with secondary and higher education.
4. No statistically significant correlation was found between preoperative anxiety and gender, patient's work status and marital status.

References

1. Freeney S. *The relationship between pain and negative affect in older adults: anxiety as a predictor of pain*. J. Anxiety Disord. 2004; 18(6): 733–744.
2. Wylde V, Dixon S, Blom AW. *The role of preoperative self-efficacy in predicting outcome after total knee replacement*. Musculoskeletal Care 2012; 10(2): 110–118.
3. Doering S, Katzlberger F, Rumpold G, Roessler S, Hofstoetter B, Schatz D. et al. *Videotape preparation of patients before hip replacement surgery reduces stress.* Psychosom. Med. 2000; 62(3): 365–373.4.
4. Sagardoy ML, Romeo MC. *Prevalence of anxiety in the presurgical area*. Rev. Enferm. 2013; 36(11): 36–40.
5. Kellgren J, Lawrence J. *Radiological assesment of osteoarthrosis*. Ann. Rheum. Dis. 1957; 16: 494–502.

6. Insall J, Hood R, Flawn L, Sullivan D. *The total condylar knee prosthesis in gonarthrosis. A five to nine-year follow-up of the first one hundred consecutive replacements*. J. Bone Joint Surg. Am. 1983; 65(5): 619–628.
7. Dawson J, Fitzpatrick R, Murray D, Carr A. *Questionnaire on the perceptions of patients about total knee replacement*. J. Bone Joint Surg. Br. 1998; 80(1): 63–69.
8. Spielberger CD, Gorsuch A, Lushane R, Vagg P, Jacobs G. *Manual for the State-Trait Anxiety Inventory*. Palo Alto, California: Consulting Psychologists Press; 1970.
9. Husted H, Holm G, Jacobsen S. *Predictors of length of stay and patients satisfaction after hip and knee replacement surgery: fast-track experience in 712 patients*. Acta Orthop. 2008; 79(2): 168–173.
10. Lenza M, Ferraz Sde B, Viola DC, Garcia Filho RJ, Cendoroglo Neto M, Ferretti M. *Epidemiology of total hip and knee replacement: a cross-sectional study*. Einstein (Sao Paulo) 2013; 11(2): 197–202.
11. Iorio R, Robb W, Healy W, Berry D, Hozack W, Kyle R. i wsp. *Orthopaedic surgeon workforce and volume assessment for total hip and knee replacement in the United States: preparing for an epidemic*. J. Bone Joint Surg. Am. 2008; 90(7): 1598–1605.
12. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. *Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030*. J. Bone Joint Surg. Am. 2007; 89(4): 780–785.
13. Ellis HB, Howard KJ, Khaleel MA, Bucholz R. *Effect of psychopathology on patient-perceived outcomes of total knee arthroplasty within an indigent population*. J. Bone Joint Surg. Am. 2012; 94(12): e84.
14. Kagan I, Bar-Tal Y. *The effect of preoperative uncertainty and anxiety on short-term recovery after elective arthroplasty*. J. Clin. Nurs. 2008; 17(5): 576–583.
15. Sjoling M, Nordahl G, Olofsson N, Asplund K. *The impact of preoperative information on state anxiety, postoperative pain and satisfaction with pain management*. Patient Educ. Couns. 2003; 51(2): 169–176.
16. Singh JA, Lewallen DG. *Predictors of use of pain medications for persistent knee pain after primary Total Knee Arthroplasty: a cohort study using an institutional joint registry*. Arthritis Res. Ther. 2012; 14(6): R248.
17. Bonnin MP, Basiglini L, Archbold HA. *What are the factors of residual pain after uncomplicated TKA?* Knee Surg. Sports Traumatol. Arthrosc. 2011; 19(9): 1411–1417.
18. Singh JA, Lewallen DG. *Medical and psychological comorbidity predicts poor pain outcomes after total knee arthroplasty*. Rheumatology (Oxford) 2013; 52(5): 916–923.
19. Hirschmann M, Testa E, Amsler F, Friederich N. *The unhappy total knee arthroplasty (TKA) patient: higher WOMAC and lower KSS in depressed patients prior and after TKA*. Knee Surg. Sports Traumatol. Arthrosc. 2013; 21(10): 2405–2411.
20. Pawlak A, Krejca M, Janas-Kozik M, Krupka-Matuszczyk I, Rajewska J, Bochenek A. *Ocena lęku i depresji w okresie okołooperacyjnym u pacjentów poddawanych rewaskularyzacji mięśnia sercowego*. Psychiatr. Pol. 2012; 46(1): 63–74.
21. Pełka-Wysiecka J, Ziętek J, Grzywacz A, Kucharska-Mazur J, Bieńkowski P, Samochowiec J. *Association of genetic polymorphisms with personality profile in individuals without psychiatric disorders*. Prog. Neuropsychopharmacol. Biol. Psychiatry 2012; 39(1): 40–46.

22. Orzechowska A, Talarowska M, Zboralski K, Florkowski A, Gałecki P. *Subiektywna ocena objawów i efektów leczenia a natężenie stresu i poziomu lęku wśród pacjentów z wybranymi chorobami skóry i układu pokarmowego*. Psychiatr. Pol. 2013; 47(2): 225–237.

23. Mojs E, Czarnecka-Iwańczuk M, Głowacka M. *Poziom lęku jako stanu i jako cechy oraz depresji we wczesnym połogu – doniesienie wstępne*. Psychiatr. Pol. 2013; 47(1): 31–40.

Address: Paweł Ziętek
Department of Orthopedics and Traumatology PUM in Szczecin
71-252 Szczecin, Unii Lubelskiej Str 1