BALIKESIR MEDICAL JOURNAL

The relationship between Medical Outcomes Study Short Form-36 (SF-36) and conventional objective outcome scales in patients with postoperative tibial plateau fractures

Postoperatif tibia plato kırıklı hastalarda Tıbbi Sonuç Çalışması Kısa Form 36 (SF-36) ile konvansiyonel objektif sonuç ölçekleri arasındaki ilişki.

Şevket Ergün Güzel[1], Zeki Taşdemir[2]

1-Kahta Devlet Hastanesi, Adıyaman, Turkey

2 -S.B.Ü Kartal Dr. Lütfi Kırdar Education and Research Hospital, İstanbul, Turkey

Öz

Amaç: Hasta temelli sonuç ölçütleri, öznel sağlık durumu ve yaşamın fonksiyonel durumu içerisinde aktif olarak kullanılmaktadır. Bu çalışmanın amacı, mevcut Diz Topluluğu Skoru (KSS), Diz Yaralanması ve Osteoartrit Sonuç Skoru (KOOS), Western Ontario ve McMaster Üniversitesi Osteoartrit Endeksi (WOMAC) ile Tıbbi Sonuçlar Çalışması Kısa Form-36 (SF) arasındaki ilişkiyi değerlendirmektir.

Yöntem: Çalışmada kliniğimizde Temmuz 2010 - Mart 2016 tarihleri arasında cerrahi olarak tedavi edilen Schatzker tip 2 ve tip 3 tibial plato kırığı olan toplam 43 hastanın 43 sağlıklı dizini ve 43 ameliyatlı dizini retrospektif olarak değerlendirdik. Hastalar haftalık olarak SF-36 Genel Fiziksel Fonksiyonel Puan ve ayrıca diz eklemi ile ilgili sorunları çözmek için kullanılan skorlama sistemleri olan WOMAC, KSS ve KOOS puanlama sistemleri ile değerlendirildi.

Sonuç ve Tartışma: KSS Fonksiyonel Skoru ve KOOS Günlük Fonksiyonel Skoru, diz ekleminin fonksiyonel değerlendirmesi için güvenilir bulundu. WOMAC fiziksel fonksiyon sonuçları ile KOOS günlük fonksiyon sonuçları arasındaki korelasyonun pozitif yönde ve% 99 güven düzeyinde anlamlı olduğu bulundu. Anket kullanımıyla yaşam kalitesini değerlendirmek ve matematiksel değerler sağlamak mümkündür. Anketlerde, toplumlara uyumlarını değerlendirmek ve ayrıca aralarındaki ilişkiyi değerlendirmek gereklidir. Bu çalışma sonucunda, yanıtların ilk önce sayısal değerlerle eşleştiği değerlendirme ölçeklerini seçerken ve kullanırken çok dikkatli olmamız gerektiğini düşünüyoruz.

Anahtar kelimeler: Kısa Form-36, Tibial Plato Kırıkları, Diz Eklemi,

Abstract

Objective: Patient-based outcome measures are actively utilized within the subjective health status and functional status of life. The aim of this study was to evaluate the correlation between existing Knee Society Score(KSS), Knee injury and Osteoarthritis Outcome Score (KOOS), Western Ontario and McMaster University Osteoarthritis Index (WOMAC) and the Medical Outcomes Study Short Form-36 (SF-36) and to evaluate their correlation with each other as well as to evaluate their measurement capabilities.

Materials and Methods: In the study, we have retrospectively evaluated 43 healthy knees and 43 operated knees of a total of 43 patients with Schatzker type 2 and type 3 tibial plateau fractures that were treated surgically between July 2010 and March 2016 in our clinic. Patients were evaluated weekly with SF-36 General Physical Functional Score and also with the WOMAC, KSS and KOOS scoring systems, which are scoring systems that are used to address specifically the problems with the knee joint.

Result and Conclusion: The KSS Functional Score and the KOOS Daily Functional Score were found to be reliable for the functional evaluation of the knee joint. We believe that the numerical scoring system used by WOMAC Functional Scoring causes distraction and we believe that the measurement effectiveness is reduced as a result. As a result of this study, we think that we need to be very careful when selecting and using evaluation scales where the responses are first matched to numerical values.

Key words: Short Form-36, Tibial Plateau Fractures, Knee joint,

Introduction:

Patient-based outcome measures are increasingly being used in evaluating the subjective health status and functional status of life. If these tools are proven and validated during the care of the patients, then they can be considered as a valuable source of information for clinicians (1). Various clinical outcome measures (scoring) are used for evaluation, where the most common of them is the Western Ontario and McMaster Universities index (WOMAC) for the evaluation of knee osteoarthritis (2)

Our aim was to evaluate the correlation of the existing knee joint functional scoring systems (KSS, KOSS, WOMAC), with the SF-36 General Physical Functional Scoring system and to evaluate their correlation with each other as well as to assess their measurement capabilities.

Materials and Method:

Ethics committee approval was obtained from Dr. Lütfi Kırdar Education and Research Hospital, ethics committee decision no: 2017/514/109/8. We retrospectively evaluated 43 healthy knees and 43 operated knees of 43 patients with Schatzker type 2 and type 3 tibial plateau fractures that were treated surgically between July 2010 and March 2016 in our clinic. In our study, surgical procedures were performed by a single surgeon. Patient questionnaires were performed with the help of a trained secretary. The mean follow-up time was 40.51 ± 21.46 (12-82) months. The mean age of the patients was 45.86 ± 11.59.

All of the patients fulfilled the clinical and radiological criteria. Exclusion criteria included history of other rheumatic diseases, presence or potentially active primary OA, severe joint inflammation in the other lower extremity and same-side lower extremity trauma (confirmed by physical examination and by laboratory parameters (ESR: 40 mm/h and serum rheumatoid factor)), presence of intra-articular or systemic use of corticosteroids, as well as patients who had used analgesics and non-steroids in the last 3 months. Patients with advanced cardiac diseases or peripheral vascular diseases were also excluded from the study.

Patients were assessed for their functional ability and for their general health status using a disease-specific questionnaire (WOMAC, KOOS, KSS) and a general health questionnaire

(Medical Results Short Form (SF-36) (4). Disease-specific questionnaires were initially administered according to the fracture (Time 1) approximately 12-82 (40.5) months after the treatment (Time 2). Acceptable translations for SF-36 and WOMAC index were used (5). Patients were assessed weekly with SF-36 General Physical Functional Score System and also with WOMAC, KSS and KOOS scoring systems.

SF-36 is a score system that is used to assess 8 sub-categories (physical functioning, physical role, bodily pain, general health, vitality, social functioning, emotional role, mental health). For each sub-category (excluding health transitions), a scale from 0 to 100 was created (4).

The WOMAC index is a questionnaire designed to examine patients with a hip or hip disease which has been self-medicated and self-treated (6). The WOMAC, which is a 24-item physical function measurement questionnaire is specific to a disease, and it consists of 3 subscales: physical function (17 items), pain (5 items) and hardness (2 items). WOMAC with a 5 scale Likert (0 to 4) was used in this study. Subscale scores were calculated by summing each item for pain score, stiffness, and physical function.

Patients were also evaluated according to their KOOS score. KOOS has five subscales. Pain (9 items); Daily Activities (ADL, 17 items); Sports and Recreation function (Sports/Rec, 5 items), Life Quality related to the knee (QoL, 4 items) and other items (7 items) (7).

Patients were then evaluated with the 'KSS (Knee Society Score) Knee Scoring' and with the 'KSS Functional Score' system. The KSS numerical value was measured in a 4-scale measurement. According to the 4-point scale, the general KSS score was evaluated as '4-Excellent' for scores between 100-85, '3-Good' for scores between 84-70, '2-Medium' for scores between 69-60, '1-Bad' for scores between 60-0. The functional scoring of KSS was evaluated as '4-Excellent' for scores between 100-80, '3-Good' for scores between 79-70, '2-Medium' for scores between 69-60 and '1-Bad' for the remaining scores between 60-0 (8).

The severity of the disease was assessed radiologically by the Kellegren Lawrence system (3). Radiologic evaluation was performed according to Kellegren Lawrence criteria on the anteroposterior and lateral radiographs of the knee under a load. The Radiological score as per the 4-Scale Kellegren Lawrence criteria were evaluated as, 18 full points for '4-Excellent', 17-12 points for '3-Good', 11-6 points for '2-Medium', and 6-0 points for '1-Bad' (9).

Statistical Study:

Age distribution of the participants was 45.86 ± 11.593. Participants; 67.4% were male and 32.6% were female. The BMI distribution was 27.57 ± 4.36.

Factor analysis was used to convert SF36 components into fewer meaningful variables. Correlation analysis was used to determine the direction and strength of the relationships between the WOMAC CSR BMI. Descriptive statistics were used for the distribution of the distributions of variables such as CSR DAİLY FUNCTION as mean ± -1 standard deviation.

SF-36 components were assessed by factor analysis. According to the preliminary evaluations, KMO value was 0.889 and sample suitability was found to be good. According to the Bartlett Sphericity Test, the correlation matrix of the SF-36 components was different from the unit matrix. For this reason, it was accepted that the necessary conditions for factor analysis had been obtained. The disclosure rate of each component was greater than 0.500, thus as a result, no component was excluded from the factor analysis.

Four factors were obtained as a result of the factor analysis. These four factors explain 92.1% of the change in nine compounds. This disclosure rate is sufficient for factor analysis. Nine components can be grouped under four headings.

From the four factors obtained, the first describes 76.2% of the total change. This factor is defined as the **'General Status'**. The second most important factor is the **'Psychological Status'** factor, which accounts for 12.8% of the total change. The third most important factor is the **'Role Difficulty'** factor which accounts for 6.8% of the total change. The fourth most important factor is the **'Health Change'** factor which accounts for 4.3% of the total change (Table 1).

Table 1. Evaluation of SF-36 components by factor analysis

	'General Status	'Psychological Status	'Role Difficulty	'Health Change
Bodily pain	0,835			
Phys. functioning	0,722			
General health	0,699			
Social functioning	0,584			
Vitality		0,839		
Mental health		0,837		
Emotional role			0,886	
Phys. role			0,719	
Health Change				0,993

Extraction Method: Principal Analysis. Rotation Metod:Varimax with KAiser Normalization

Patients were evaluated with KSS scoring system. KSS was measured both numerically and also by a 4-scale system. According to the numerical results; the overall score of KSS was found to be 83.79 ± 19.55, and the KSS functional score was determined as 89.77 ± 15.20. According to the results of the 4-scale system, the overall score of KSS was 3.40 ± 0.95 and the KSS functional score was 3.60 ± 0.85.

Patients were also evaluated according to their KOOS score. The overall KOOS score was found to be 76.99 ± 21.17. The KOOS sub parameter having the highest KOOS score average in the patients was observed to be the **'Daily Function'** parameter. The KOOS daily function score was found to be 82.15 ± 21.48. The KOOS sub parameter having the lowest KOOS score was the **'Life Quality'** parameter. The Life Quality parameter score was found to be 60.85 ± 28.20; but the **'Sportive Function**' score was also observed to be very close to the 'Quality of Life' score.

Patients were evaluated according to WOMAC scoring. The overall WOMAC score was obtained as 73.60 ± 28.54. The WOMAC sub-parameter, which had the highest WOMAC

score average, was the 'Pain' sub-parameter. The mean of the pain parameters was found to be 75.23 ± 27.60. The sub-parameter with the lowest WOMAC score average was the 'Physical Function' sub parameter. The physical function score was found to be 72.97 ± 29.29.

Mean and standard deviation values of the results were calculated. Subsequently, the obtained values were compared with the correlation analysis method. The correlation coefficient specifies the direction and magnitude of the linear relationship between the two variables.

According to the numerical results; Radiological score as per the Kellgren Lawrence criteria was found to be 14.33 ± 2.99. In addition, Radiological score as per Kellgren Lawrence criteria was determined as 2.31 ± 0.59 according to the scaled results.

Correlations between SF-36 physical function results and WOMAC physical function, KOOS daily function, KSS functional results were found to be significant with positive direction and with a 99% confidence level. The correlation between KSS functional results and SF36 physical function results was found to be the highest among the parameters studied. Correlations between KSS functional results and WOMAC physical function and KOOS daily function were found to be significant with a positive direction and with 99% confidence levels. The correlation between KSS functional results and KOOS daily function results was also found to be very high. The correlation between KSS functional results and the WOMAC physical function results was observed to be moderate. The correlation between WOMAC physical function results and KOOS daily function results was found to be significant, with positive direction and with 99% confidence level (Table 2).

Correlations		KSS Functional	SF-36 Phys. Function	WOMAC Phys. Function	KOOS daily Function
KSS Functional	Pearson Correlation	1	.847(**)	.664(**)	.917(**)
	Sig. (2-tailed)		0,000	0,000	0,000
	N	43	43	43	43
SF-36 Physical function	Pearson Correlation	.847(**)	1	.612(**)	.817(**)
	Sig. (2-tailed)	0,000		0,000	0,000
	N	43	43	43	43
WOMAC Physical function	Pearson Correlation	.664(**)	.612(**)	1	.721(**)
	Sig. (2-tailed)	0,000	0,000		0,000
	N	43	43	43	43
KOOS Daily function	Pearson Correlation	.917(**)	.817(**)	.721(**)	1
	Sig. (2-tailed)	0,000	0,000	0,000	
	N	43	43	43	43

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2 Correlations between SF-36 physical function, KSS functional score, KOOS daily function, WOMAC physical function

Discussion

Treatment and care of skeletal system diseases, which have occurred after a trauma, play an important role in maintaining health and improving the quality of life. Evaluating the quality of life and to provide mathematical values is possible with the use of questionnaires. In the questionnaires, it is necessary to evaluate their adaptation to societies and also to evaluate the correlation between them.

The WOMAC Physical Function Scoring system scales the severity of the impact numerically and then prompts the patient to give numerical answers. In addition to the base and ceiling effects of the Turkish version of the WOMAC index, scores have a good frequency distribution at every subscale. The correlation between the SF-36 and the Turkish version of the WOMAC index showed differences with good convergent validity (5).

There are linear relationships between the physical subscale of the WOMAC index and the physical pain subscale of the SF-36, and a linear relationship between the physical subscale of the SF-36 and the pain subscale of the WOMAC index. This finding is not surprising, since pain is closely related to the physical function of traumatic OA (10). WOMAC scores do not correlate with the patient's pain intensity, patient's age, and physical function (11, 12). We

also have found that BMI is not related to the WOMAC score. This result is consistent with the observations made by Salaffi et al. (13).

The researchers observe that the educational level is an important factor in the perceived pain (12-14). They were not able to find any correlation between the education level and WOMAC scores (5). Although this finding indicates that the patient, who is a possible source of prejudice, is not affected at the semantic level, the answers to the questionnaire are necessary in order to confirm the findings.

We did not find a significant correlation between traumatic OA and WOMAC scores. This finding was found to be consistent with the findings of Dr. Creamer et al. (12). Findings in the present study have shown that no correlation was evident between radiographic damage and functional disability and pain intensity. The association between these findings, was accepted at early observations between radiographic magnitude, functional disability and pain (15, 16).

Knee Injury and Osteoarthritis Outcome Score KOOS demonstrates the ability to respond to adequate content validity, internal consistency, and test and retest reliability, validity, age and the ability to respond to sub-scales. Cross-cultural validity and measurement errors require further evaluation of the validity of the KOOS Physical Function Short Form (17). KOOS is designed for young, middle-aged and elderly adults with knee osteoarthritis (OA) and has the evaluation of surgical, pharmacological and environmental effects, which can be used to monitor the effects on the course and the outcome of the disease (18).

Correlations between KSS Functional Score and KOOS Daily Functional Score and SF-36 General Functional Score were found to be consistent with the data in the literature (19, 20). Both classifications were found to be reliable for the functional evaluation of the knee joint.

We believe that the numerical scoring system used by WOMAC Functional Scoring causes distraction and consequently the effectiveness of the measurement is reduced. As a result of this study, we think that we need to be very careful when selecting and using evaluation scales where the responses are first matched to numerical values.

References:

1. Boers M, Kirwan JR, Wells G, Beaton D, Gossec L, d'Agostino MA, et al. Developing core outcome measurement sets for clinical trials: OMERACT filter 2.0. J Clin Epidemiol 2014;67:745e53.

2. Brazier JE, Harper R, Munro J, Walters SJ, Snaith ML. Generic and condition-specific outcome measures for people with osteoarthritis of the knee. Rheumatology (Oxford) 1999;38:870e7.

3. Koçyiğit, H, Aydemir Ö, Fişek G, Ölmez N, & Memiş AK Form-36 (KF-36)'nın Türkçe versiyonunun güvenilirliği ve geçerliliği. Ilaç ve tedavi dergisi 1999;12(1):102-6.

4. Tüzün EH, Eker L, Aytar A, Daşkapan A, Bayramoğlu M. Acceptability, reliability, validity and responsiveness of the Turkish version of WOMAC osteoarthritis index. Osteoarthritis and cartilage 2005;13(1):28-33.

5. Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW. Validation study of OMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. J Rheumatol 1988;15:1833e40.

6. Gul ED, Yilmaz O, Bodur H. Reliability and validity of the Turkish version of the knee injury and osteoarthritis outcome score-physical function short-form (KOOS-PS). Journal of back and musculoskeletal rehabilitation 2013;26(4):461-466.

7. Insall, John N, et al. "Rationale of the Knee Society clinical rating system." *Clin Orthop relat res* 248.248 (1989): 13-14.

8. Altman R, Brandt K, Hochberg M, Moskowitz R, Bellamy N, Bloch DA, et al. Design and conduct of clinical trials in patients with osteoarthritis: recommendations from a task force of the Osteoarthritis Research Society. Results from a workshop. Osteoarthritis Cartilage 1996;4:217e43.

9. Kellgren JH, Lawrence JS. Radiologic assessment of osteoarthritis. Ann Rheum Dis, 1987; 16: 494-501.

10. Guccione AA, Felson DT, Anderson JJ. Defining arthritis and measuring functional status in elders: methodological issues in the study of disease and physical disability. Am J Public Health 1990;80:945e9.

11. Summers MN, Haley WE, Reveille JD, Alarcon GS. Radiographic assessment and psychologic variables as predictors of pain and functional impairment in osteoarthritis of the knee or hip. Arthritis Rheum 1988; 31:204e9.

12. Creamer P, Lethbridge-Cejku M, Hochberg MC. Factors associated with functional impairment in symptomatic knee osteoarthritis. Rheumatology 2000;39: 490e6.

13. Salaffi F, Leardini G, Canesi B, Mannoni A, Fioravanti A, Caporali R, et al. Reliability and validity of the Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index in Italian patients with osteoarthritis of the knee. Osteoarthritis Cartilage 2003;11:551e60.

14. Salaffi F, Cavalieri F, Nolli M, Ferraccioli G. Analysis of disability in knee osteoarthritis. Relationship with age and psychological variables but not with radiographic score. J Rheumatol 1991;18:1581e6.

15. McAlindon TE, Cooper C, Kirwan JR, Dieppe PA. Determinants of disability in osteoarthritis of the knee. Ann Rheum Dis 1993;52:258e62.

16. Odding E, Valkenburg HA, Algra D, Vandenouweland FA, Grobbee DE, Hofman A. Associations of radiological osteoarthritis of the hip and knee with locomotor disability in the Rotterdam Study. Ann Rheum Dis 1998;57:203e8.

17. Collins NJ, Prinsen CAC, Christensen R, Bartels EM, Terwee CB, Roos EM. Knee Injury and Osteoarthritis Outcome Score (KOOS): systematic review and meta-analysis of measurement properties. Osteoarthritis and Cartilage 2016;24(8):1317-1329.

18. Roos EM, Roos HP, Lohmander LS, Ekdahl C, Beynnon BD. Knee Injury and Osteoarthritis Outcome Score (KOOS)edevelopment of a self-administered outcome measure. J Orthop Sports
Phys Ther 1998;28:88e96

19. Liljensøe A, Lauersen JO, Søballe K, Mechlenburg I. Overweight preoperatively impairs clinical outcome after knee arthroplasty: a cohort study of 197 patients 3–5 years after surgery. Acta orthopaedica 2013;84(4):392-397.

20. Roos EM, Toksvig-Larsen S. Knee injury and Osteoarthritis Outcome Score (KOOS)–validation and comparison to the WOMAC in total knee replacement. Health and quality of life outcomes 2003; 1(1): 17.