FUNCTIONAL EVALUATION OF THE KNEE IN SUBJECTS WITH PATELLOFEMORAL PAIN SYNDROME (PFPS): COMPARISON BETWEEN KOS AND IKDC SCALES

ORIGINAL ARTICLE

Daniela Abrahão Siqueira[1]
Mário Antônio Baraúna[1]
Valdeci Carlos Dionísio[2]

1. Physiotherapy Course of the Triangulo University Center – UNITRI – Uberlândia, Minas Gerais, Brazil.
2. Professor of the Physiotherapy Course of the Federal University of Uberlândia – UFU – Uberlândia, Minas Gerais, Brazil.

Mailing address:
Valdeci Carlos Dionisio
Rua da Carioca, 746, ap. 102
38411-046 – Copacabana
Uberlândia, MG – Brasil
E-mail: vcdionisio@gmail.com

ABSTRACT

Introduction and objective: Many instruments have been proposed for the knee assessment, making its choice often difficult. Among these instruments, we can mention the Knee Injury and Osteoarthritis Outcome Score (KOS) and the International Knee Documentation Committee (IKDC) scales; however, it is unclear which of them would be better to evaluate the knee of subjects with patellofemoral pain syndrome (PFPS). The objective of this study was to compare the KOS and IKDC scales evaluation to verify which of them would be more appropriate to identify impairment in patients with PFPS. Methods: The study included 31 PFPS subjects, aged between 18 and 39 years (24.29 ± 4.09); 27 subjects were female and 4 were male. All subjects were submitted to KOS and IKDC scales on the two occasions. The second application served as reliability evidence (PCKOS and PCIKDC).The analysis of statistical correlation between the scales was done with the Spearman and Wilcoxon tests, considering significant $p < 0.05$. Results: The Spearman correlation test presented strong correlation between KOS and PCKOS ($r = 0.99$, $p < 0.001$) and IKDC and PCIKDC ($r = 0.96$, $p < 0.001$). There was a weak correlation between KOS and IKDC ($r = 0.46$, $p < 0.01$) and PCKOS and PCIKDC ($r = 0.55$, $p < 0.002$). The Wilcoxon test revealed differences between KOS and IKDC ($p < 0.001$) and between PCKOS and PCIKDC ($p < 0.001$). There was equality between KOS and PCKOS ($p > 0.10$) and difference between IKDC and PCIKDC ($p < 0.02$). Conclusion: The KOS and IKDC scales were reliable during the application in patients with PFPS, where the KOS received greater reliability when compared to the IKDC.

Keywords: knee joint, scales, activity of daily living.

INTRODUCTION

Patellofemoral pain syndrome (PFPS) is known as one of the main causes for knee pain, both in orthopedic clinics[1], and sports practice, as in running[2] and in young athletes[3]. Its beginning is subtle, and it is especially more common in young women, adolescents and athletes of both sexes[4], reaching one out of four people[5]. Although some authors define it as anterior or retropatellar pain in the knee joint, in the absence of other conditions[6], its etiology is multifactorial[7], which makes its definition complex. Knee anterior pain may be a result of many factors such as inflammation of the synovial membrane and/or fat pad, retinacular neuromas, intra-bone pressure and increase of bone metabolism[8]. These pathophysiological processes are derived from disorders in the femoropatellar joint, which can show local proximal or distal generating factors[7].

This scenario results in important functional limitations such as climbing up and down steps, squatting or kneeling, remaining seated for prolonged time[9]. Moreover, inflammation and pain may generate arthrogenic muscular inhibition[10] aggravating the irritation process in the joint, with consequent increase of functional limitations, regardless of the radiological and arthroscopic findings[11].

Many instruments have been proposed to facilitate functional diagnosis and better characterize functional limitations in patients with knee injuries; however, not all of them include necessary items for suitably evaluating alterations in the femoropatellar joint. The results of a functional scale may contribute to the evaluation of strategies of therapeutic intervention. When the functional activities such as climbing up and down stairs, sitting, standing up and squatting are assessed in the application of the functional scale, it may reveal the level of compromising as well as the level of efficiency of the proposed interventions[12].

Many instruments were tested and validated for the knee assessment [13-21]; however, part of these instruments was built to evaluate the knee in a broader scope and another part specifically to a specific dysfunction [20-22], and even for a specific population[22]. Thus, there is great diversity of instruments, making the choice of the best one many times difficult, especially from the functional point of view.

Many investigations have been carried out in an attempt to verify the best instrument for the knee evaluation[20,23,24], including concerning the post-surgery period of cartilage defects[21]. The IKDC scale (International Knee Documentation Committee) designed by the AOSSM committee (American Orthopedic Society for Sports Medicine) and the ESKSA (European Society for Knee Surgery and Arthroscopy) in 1987 and later revised in 1997[15] has been the most recommended to the orthopedic community, including in femoropatellar disorders[22]; although the Knee Injury and Osteoarthritis Outcome Score (KOOS) scale has also

been recommended when considering osteoarthritis[20,23,24]. The IKDC is composed of 10 objective questions subdivided in seven questions about symptoms, two questions about sports activities and two questions about pre and post-functionality.

On the other hand, the KOS (Knee Outcome Survey) scale produced in 1998 by Irrgang et al.[13] also presents the evaluation of relevant aspects concerning functional limitations in the daily living[20,24], which may be very useful in the evaluation of PFPS patients[12,24,25]. This questionnaire is composed of two separate scales, the Activities of Daily Living Scale (ADLS) to evaluate the symptoms and functional limitations during the activities of daily living, and the Sports Activities Scale (SAS) to evaluate the symptoms and functional limitations during sports activities[26].

However, there is no consensus on which of these scales (IKDC or KOS) could better evaluate the PFPS patients, since no articles approaching this theme have been found in the literature, nor comparative studies between these two scales have been performed with this population. Therefore, the aim of this study was to compare the functional evaluation scales KOS and IKDC and verify which one would be more appropriate in the identification of the level of compromising of the PFPS patients. The identification and improvement of the evaluation scales may contribute in the early and more accurate identification of knee disorders, favoring prevention of degenerative injuries and evaluation of the proposed interventions, either surgical or rehabilitation, favoring sports performance.

METHODOLOGY

Subjects

The subjects were recruited in the Department of Orthopedics and Traumatology of the Clinics Hospital of Uberlândia (UFU). They were 31 PFPS patients, aged between 18 and 39 years (mean 24.29 ± 4.09), with 27 subjects were female and four were male. All subjects were submitted to the KOS and IKDC scales after having signed the Free and Clarified Consent Form approved by the Ethics in Research Committee of the University Center of the Triângulo (Protocol number 668.338/2008).

In order to be included in the study, the subjects should present clinical symptoms of femoropatellar pain and be without any evidence of any other specific alteration on the knee, diagnosed by an orthopedist of the service. The subjects presented at least two of the following pain conditions in the femoropatellar region: 1) during prolonged sitting time, squatting, running, kneeling, hopping and jumping; 2) onset which was not related to any specific trauma accident; 3) in the palpation of at least one of the patellar facets or during squatting using lower limbs.

Exclusion criteria were: to have any other intra-articular disease, including menisci, ligament, tissue or patellar tendon laxity, iliotibial band, goose foot tendonitis, evidence of knee effusion or referred pain in the low back or hip region, history of patellar dislocation, previous surgery in the femoropatellar joint. The subjects older than 40 years were also excluded to reduce the possibility of degenerative disease as cause for the pain.

Procedure

The subjects recruited in the present study were submitted to the KOS scale[14] and the IKDC questionnaire of knee subjective evaluation[15]. The two scales were applied on the same day, and after two days, they were reapplied for confidence proof. The main premise for valid appreciation of the confidence proof is that the secondary condition measured by the instrument remained stable between repeated measurements. All subjects were able to follow the instructions.

Data processing

The recordings on the Scale of Activities of Daily Living were calculated as described by Irrgang *et al.*[13], resulting in punctuation from 0 to 100. Punctuation 100 indicates that the individual did not present symptoms or functional limitations related to the knee.

Concerning the IKDC scale, the responses of each item were punctuated according to description by Irrgang *et al.*[15], resulting in punctuation ranging from 0 to 100. Punctuation of 100 indicates that the individual did not present any limitation with activities of daily living or sports activities and absence of symptoms.

Statistical analysis

All data were fed to a database for computer analysis. Statistical analyses were performed with the version 5.0 of the Statistica for Windows (Statsoft, Inc.) statistical program. The Shapiro-Wilk test revealed that data were not modeled in normal distribution; hence, the Wilcoxon test was chosen to compare the scales. Spearman correlation test was applied for correlation between the KOS and IKDC scales as well as respective confidence proof.

RESULTS

The questionnaires correlation between the first and second administration, the so-called confidence proof (CP) may be observed in figure 1. The result of the Spearman correlation test reveals strong correlation between KOS and PCKOS ($r = 0.99$; $p < 0.001$) and IKDC and PCIKDC ($r = 0.96$; $p < 0.001$). On the other hand, there was moderate correlation between KOS and IKDC ($r = 0.46$; $p < 0.01$) and PCKOS and PCIKDC ($r = 0.55$; $p < 0.002$).

Subsequently, in the comparison between scales, the Wilcoxon test revealed difference between KOS and IKDC ($p < 0.001$) and between PCKOS and PCIKDC ($p < 0.001$). On the other hand, there was equality between KOS and PCKOS ($p > 0.10$) and difference between IKDC and PCIKDC ($p < 0.02$).

DISCUSSION

According to Dixit *et al.*[27], there is still need of functional assessment in the filing of knee conditions, with special attention to the PFPS context. It is a constant process the search for measuring instruments which translate more accurately the functional and subjective consequences of the knee situation[28]. The measurement properties should be clear and correlate with the specific goal[18].

Therefore, strong statistic correlation between the scales and the confidence proof was obtained (KOS x PCKOS; IKDC x PCIKDC). Nigri *et al.*[18] also applied the KOS for validation in 53

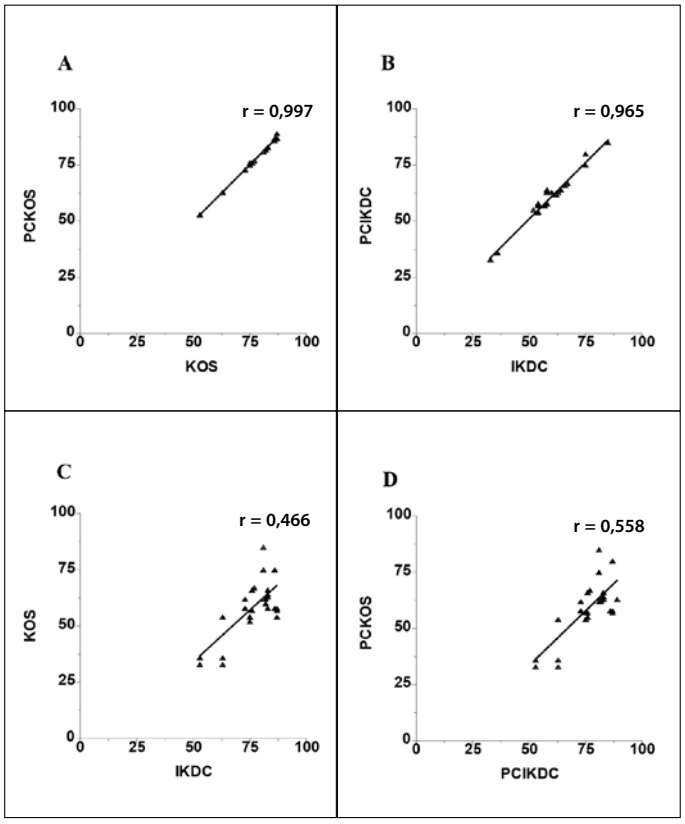

Figure 1. Illustration of the correlation between the first and second application of the KOS (A) and IKDC (B) scales. Correlation between the scales on the first (C) and second application (D) is also presented.

patients and obtained strong confidence rate demonstrating that the concordance values were high. Tanner *et al.*[19] evaluated quality of life of patients with knee disorders and found the best results for the IKDC and KOOS scales. Nonetheless, the findings by Garratt *et al.*[16], in a systematic review, show that this correlation between the IKDC scale and its confidence proof was not found as strong as what was found in our results. All subjects of the present study presented stable conditions, that is to say, without sudden alterations of health status in a short period of time. This fact may justify the optimum concordance of the two scales in the two occasions.

The Wilcoxon test revealed that the KOS scale was similar to the confidence proof, differently from the IKDC. The fact shows that the KOS was more reliable, with characteristics of easy application and understanding of the parameters questioned on the first and second applications. This strong concordance of KOS may be also explained by the fact that this scale is not as dependent on the examiner[13]. During the administration of the IKDC certain doubt from the side of the subjects during its application was observed. Similarly, in the study by Abdalla *et al.*[29], the IKDC scale, already validated for Portuguese, was applied in 15 women post-reconstruction of ACL. Certain difficulty from the side of the reader was also observed.

The fact that the confidence proof was only applied two days after the first application of the scale could partly justify the strong concordance of the scales in the present study. On the other hand, this short time was sufficient to reveal that the IKDC presented difference between the two applications. Generally speaking, the IKDC scale presented lower classification results compared to the KOS, corroborating the results by Abdalla *et al.*[30]. In this study it was confirmed that the IKDC obtained lower results compared to the Cincinnati and Lysholm and a great percentage of divergence in the obtained results. Risberg[31] stated that the IKDC scale, besides presenting low sensitivity to time alterations, tries to classify the data by category rather than numerically as in the other scales. This is a very important consideration, since the data organized by category may result in consistent information loss when compared to continuous numerical data.

In the study by Brinker *et al.*[32] with 91 athletes without previous history of knee injury, the authors compared the result of four different scales, including the IKDC. It was observed that the IKDC scale demonstrated much lower numerical data when compared to the ones found by the other ones. The most relevant information in this result is the fact that out of the 91 evaluated athletes, 27 were athletes from the first league and were highly active (mean of 20 hours/week). Out of these, only 60% were classified as "normal" by the IKDC questionnaire. Similar data were obtained in another study with 251 athletes. The authors pointed out that the "pessimistic" mode the questionnaire classifies the data also influences on the results with the IKDC[33].

The correlations were moderate between the two scales, probably by the following differences: in the KOS questionnaire there is not a specific question to evaluate physical/functional status[18]. Additionally, in the KOS scale it is not possible to specifically punctuate functional activity, since it is questioned in many situations, differently from pain which can be specifically punctuated. On the other hand, in the IKDC scale all the functional activities are punctuated in a single question, while in the KOS each functional activity receives a specific punctuation. Pain and functional activity are also possible to be punctuated in it.

Weitzel and Richmond[12] promoted a review of many instruments used for the different knee disorders. However, those who studied the IKDC scale and recommended it for tis good results applied it in subjects with knee laxity and ACL reconstruction, rather than in PFPS patients, being hence a possible justification for the clashing results in our study.

The quantity of existing instruments is clearly revealing of the dissatisfaction this theme still causes. The scales we present, despite inevitably common elements, differently punctuate the relative importance of each criterion and in certain aspects present disadvantage. Nevertheless, with the continuation of comparative studies, these metric instruments will be able to be adjusted and remodeled in the designing of questionnaires more efficient for their application in the clinical practice.

CONCLUSION

The KOS and IKDC scales present reliability during their application in PFPS patients and the KOS received higher confidence proof when compared with the IKDC.

All authors have declared there is not any potential conflict of interests concerning this article.

REFERENCES

1. Wood L, Muller S, Peat G. The epidemiology of patellofemoral disorders in adulthood: a review of routine general practice morbidity recording. Prim Health Care Res Dev 2011;12:157-64. http://dx.doi.org/10.1017/S1463423610000460.
2. Taunton JE, Ryan MB, Clement DB, McKenzie DC, Lloyd-Smith DR, Zumbo BD. A retrospective case--control analysis of 2002 running injuries. Br J Sports Med 2002;36:95-101.
3. Adirim TA, Cheng TL. Overview of injuries in the young athlete. Sports Med 2003;33:75-81.
4. Pulzatto F. A influência da altura do step no exercício de subida posterior: Estudo eletromiográfico em indivíduos sadios e portadores da síndrome da dor fêmoro-patelar. Acta Ortop Bras 2005;13:168-70.
5. Wilk KE, Reinold MM. Principles of Patellofemoral Rehabilitation. Sports Med Arthrosc 2001;9:325-36.
6. Cowan SM, Bennell KL, Hodges PW, Crossley KM, McConnell J. Delayed onset of electromyographic activity of vastus medialis obliquus relative to vastus lateralis in subjects with patellofemoral pain syndrome. Arch Phys Med Reahabil 2001;82:183-9.
7. Powers CM, Bolgla LA, Callaghan M, Collins N, Sheehan F. Patellofemoral pain: proximal, distal, and local factors, 2nd international research retreat. J Orthop Sports Phys Ther 2012;42:A1-A54. Epub 2012 Jun 1.
8. Dye SF. The pathophysiology of patellofemoral pain: a tissue homeostasis perspective. Clin Orthop Relat Res 2005;436:100-10.
9. Herrington L. The effect of patellar taping on quadriceps peak torque and perceived pain: a preliminary study. Phys Ther 2001;2:23-8.
10. Hopkins JT, Ingersoll CD, Krause BA, Edwards JE, Cordova ML. Changes in soleus motoroneuron pool excitability after artificial knee joint effusion. Arch Phys Rehabil 2000;81:1199-203.
11. Tang SFT, Chen C-K, Hsu R, Chou S-W, Hong W-H, Lew HL. Vastus medialis obliquus and vastus lateralis activity in open and closed kinetic chain exercises in patients with patellofemoral pain syndrome: an electromyographic study. Arch Phys Med Rehabil 2001;82:1441-5.
12. Weitzel PP, Richmond JC. Critical evaluation of different scoring systems of the knee. Sports Med Arthrosc 2002;10:183-90.
13. Irrgang JJ, Snyder-Mackler L, Wainner, RS, Fu FH, Harner CD. Development of a patient-reported measure of function of the knee. J Bone Joint Surg. 1998;80A:1132-45.
14. Bennell K, Bartam S, Crossley K, Green S. Outcome measures in patellofemoral pain syndrome: test–retest reliability and interrelationships. Phys Ther Sport 2000;1:32-41.
15. Irrgang JJ, Anderson AF, Boland AL, Harner CD, Kurosaka M, Neyret P, et al. Development and validation of the International Knee Documentation Committee Subjective Knee Form. Am J Sports Med 2001;29:600-13.
16. Garratt AM, Brealey S, Gillespie WJ; DAMASK Trial Team. Patient-assessed health instruments for the knee: a structured review. Rheumatol (Oxford) 2004;43:1414-23.
17. Crossley KM, Bennell KL, Cowan SM, Green S. Analysis of outcome measures for persons with patellofemoral pain: which are reliable and valid? Arch Phys Med Rehabil 2004;85:815-22.
18. Nigri PZ, Peccin MS, Almeida GJM, Cohen M. Tradução, Validação e Adaptação Cultural da Escala de Atividade de Vida Diária. Acta Ortop Bras 2007;15:101-4.
19. Tanner SM, Dainty KN, Marx RG, Kirkley A. Knee-Specific Quality-of-Life Instruments. Am J Sports Med 2007;35:1450-8.
20. Lysholm J, Tegner Y. Knee injury rating scales. Acta Orthop 2007;78:445-53.
21. Hambly K, Griva K. IKDC or KOOS? Which Measures Symptoms and Disabilities Most Important to Postoperative Articular Cartilage Repair Patients? Am J Sports Med 2008;36:1695-704.
22. Bremner-Smith AT, Ewings P, Weale AE. Knee scores in a 'normal' elderly population. Knee 2004;11:279-82.
23. Roos EM, Lohmander LS. The Knee Injury and Osteoarthritis Outcome Score (KOOS): from joint injury to osteoarthritis. Health Qual Life Outcomes 2003;1:64. doi:10.1186/1477-7525-1-64.
24. Marx RG, Jones EC, Allen AA, Altchek DW, O'Brien SJ, Rodeo SA, et al. Reliability, validity, and responsiveness of four knee outcome scales for athletic patients. J Bone Joint Surg Am 2001;83A:1459-69.
25. Piva SR, Gil AB, Moore CG, Fitzgerald GK. Responsiveness of the activities of daily living scale of the knee outcome survey and numeric pain rating scale in patients with patellofemoral pain. J Rehabil Med 2009;41:129-35.
26. Gonçalves CCK, Peccin MS, Almeida GJM, Cohen M. Tradução, validação e adaptação cultural da escala de atividade esportiva. Acta Ortop Bras. [periódico na Internet]. 2007; 15(5):246-250. Disponível em URL: http://www.scielo.br/aob.
27. Dixit S, Difiori JP, Burton M, Mines B. Management of patellofemoral pain syndrome. Am Fam Physician 2007;75:194-202.
28. Windsor RE, Insall, JN, Warren RF, Wickiewicz TL The Hospital for Special Surgery knee ligament rating form. Am J Knee Surg 1988;1:140-5.
29. Abdalla RJ, Camanhol GL, Coheni M, Forgas CR, Monteiro CG, Jeremias Jr SL, et al. Análise das complicações na reconstrução do LCA em pacientes do sexo feminino. Revista do Joelho SBCJ 2002;2:17-24.
30. Abdalla, RJ, Camanhol GL, Coheni M, Forgas CR, Monteiro CG, Jeremias Jr. S.L, Mosconi FV. Estudo comparativo entre os questionários de avaliação funcional do joelho: IKDC, CINCINNATI E LYSHOLM. Revista do Joelho SBCJ 2001;1:11-4.
31. Risberg MA. Sensitivity to changes over time for the IKDC form, Lysholm score, and the Cincinnati Knee Score, in Knee. Surg Sports Traumatol Arthosc 1999;7:152-9.
32. Brinker MR, Garcia R, Barrack RL, Timon S, Guinn S, Fong B. An analysis of sports knee evaluation instruments. Am J Knee Surg 1999;12:15-24.
33. Moseley JB, Tran A, Lintner D, Chiment B, Bocell JR. Knee symptoms in healthy athletes. Orthop Transactions 1995;18:1016-7.