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Original Article

Reproducibility assessment of different descriptions of the Kellgren and Lawrence classification for osteoarthritis of the knee☆

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ABSTRACT

Objective: To assess the inter- and intraobserver reproducibility of the original version and different descriptions of the Kellgren and Lawrence classification used in epidemiological studies for osteoarthritis of the knee.
Methods: The study included 72 patients with osteoarthritis of the knee. Three medical members of the Brazilian Society of Knee Surgery were invited to evaluate the images. An intra- and interobserver analysis was conducted, with an interval of one month. The intraobserver agreement was analyzed using the weighted Cohen's Kappa coefficient. The interobserver agreement was analyzed using the Krippendorff alpha coefficient (α).
Results: The intraobserver assessment indicated conflicting results. In the interobserver analysis, the level of agreement was superficial.
Conclusions: The classification of Kellgren and Lawrence and its variants generated a low reproducibility between observers. The intraobserver analysis showed a lack of uniformity in the use of this classification and its variants, even among experienced observers.

Avaliação da reprodutibilidade das diferentes descrições da classificação de Kellgren e Lawrence para osteoartrite do joelho

Palavras-chave:
Joelho
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RESUMO

Objetivo: Avaliar a reprodutibilidade inter e intraobservador da versão original e das diferentes descrições da classificação de Kellgren e Lawrence usadas em estudos epidemiológicos para osteoartrite do joelho.
Métodos: Foram estudados 72 pacientes com diagnóstico de osteoartrite do joelho. Três médicos membros da Sociedade Brasileira de Cirurgia do Joelho foram convidados para avaliar

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as imagens. Análises intra e interobservador foram feitas com intervalo de um mês. A concordância intraobservador foi analisada por meio do coeficiente Kappa de Cohen ponderado. Na análise interobservador foi usado o coeficiente alpha de Krippendorff (α).

Resultados: A avaliação intraobservador apresentou resultados discordantes. Na análise interobservador, o grau de concordância foi superficial.

Conclusões: A classificação de Kellgren e Lawrence e suas variantes geraram uma baixa reprodutibilidade entre os observadores. A análise intraobservador apresentou resultados discordantes, demonstrou que há falta de uniformidade no uso dessa classificação e de suas variantes mesmo entre observadores experientes.

Introduction

Osteoarthritis is one of the most common diseases worldwide, with no distinction or ethnic preference.[1] The knee, being a load-bearing joint, is a frequent involved site.[1]

The radiological evaluation is paramount in patients with osteoarthritis of the knee. In the radiographic study, one is able to grade the severity of joint involvement, measure the axis, assess ligament instability or bone loss, and also indicate the type of treatment, as well as the necessary implant when surgery is needed.

The Kellgren and Lawrence grading is the most widely used classification for knee osteoarthritis when X-rays are assessed[2]; however, five versions of this classification have been described in epidemiological studies.[2]

In order to be reproducible, a classification should be simple, easy to remember, and helpful in guiding treatment and defining the prognosis of these injuries.[3] A characteristic that must be present in any classification is reproducibility.[3]

This study aimed to assess the interobserver and intraobserver reproducibility of the original version and of the different variants of the Kellgren and Lawrence classification used in epidemiological studies for osteoarthritis of the knee.

Material and methods

The study was presented in detail to and approved by the Ethics Committee under CAAE No. 31378714.6.0000.5273. All participants signed a informed consent prior to enrollment. They were also offered a financial incentive to participate.

In this hospital's outpatient clinic, 200 patients with osteoarthritis of the knee were selected. There was no age limitation. Exclusion criteria were: patients who underwent prior surgical procedures in the knee to be assessed or who underwent joint replacement on the contralateral knee, as well as patients with other rheumatologic diseases. After applying the exclusion criteria, 72 patients and their radiographic studies were selected to comprise the sample.

The study consisted of three observers, members of the Brazilian Society of Knee Surgery and part of the hospital staff, who conducted the radiographic analysis.

Knee radiographs in anteroposterior (AP) with bipedal load, lateral, axial patellar at 30°, and Rosenberg views were obtained from all patients, following a standard protocol. The AP view was made with the knee in extension and bipedal support. The tube-film distance was 1 m, and the radius was centered at the lower pole of the patella. The lateral view was achieved with the knee in 20° of flexion with patient standing; the tube-film distance was 1 m. Rosenberg view was made in posteroanterior (PA), under load and 45° of flexion. Feet were positioned parallel and aligned forward. The patella touched the film. X-rays were centered at the level of the inferior pole of the patella, with a craniocaudal inclination of 10° and a tube-film distance of 1 m.

A Shimatzo X-ray device, rated at 50 kV and 40 mA, was used. The exams were overseen by the main investigator regarding image quality and were repeated if considered of poor technical quality; patient positioning, knee, and X-ray device angulation were also observed. Angles were measured with a goniometer.

Scanned images were delivered on a CD-ROM to the observers. In order to minimize bias due to the difficulty of interpretation or possible forgetfulness, the classification and its variants are described in Table 1.

Radiographic analyses were performed blindly on two occasions, with a one-month interval, and the interpretations of the three observers were scanned for subsequent statistical analysis.

Data were analyzed with statistical analysis software R version 3.1.0, and SPSS (Statistical Package for the Social Sciences) version 22.0. The intraobserver agreement, which compared both assessments from the same observer for each of the five classifications, was analyzed by the weighted Cohen's Kappa coefficient.

The weighted Cohen's Kappa coefficient ranges from −1 to 1; values less than or equal to 0 represent no agreement and 1 represents total agreement. In this study, the classification adopted was the one proposed by Byrt,[4] as described in Table 2. The coefficients were calculated using the "psy" package of R.

In the interobserver analysis, another measure of agreement was used, Krippendorf's alpha coefficient (α). The rating of the agreement, given the value of α, was the same as that presented in Table 2. The coefficients were calculated using the Kalpha macro in SPSS.