

## **Accuracy Test of Lequesne Index for Radiology Imaging in Genu Osteoarthritis**

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### **ABSTRACT**

**Introduction.** Osteoarthritis (OA) is a degenerative joint disease associated with damage to the joint cartilage and surrounding tissue. Osteoarthritis can affect all types of joints, but generally affects the knee, hip, hand, spine and leg joints. The main clinical features of OA are pain, stiffness and limited mobility. Lequesne index has the advantage of being easily and quickly used to assess the results of new drug research without objective evidence and can be used to follow OA for a long period of time.

**Methods.** This study was a diagnostic study in the form of an accuracy test to assess sensitivity, specificity, positive predictive value and negative expected value.

**Results.** 35 study subjects were obtained according to inclusion. Sensitivity value is 82.41%, specificity value is 71.4%, positive estimation value is 0.92% and negative estimation value is 0.50% and conformity value (kappa value) is 0.80.

**Conclusion.** Lequesne index has a good value of conformity to the radiologic picture with a kappa value of 0.80.

**Keywords:** lequesne index, radiology imaging, osteoarthritis genu

## **Introduction**

Osteoarthritis (OA) is a degenerative joint disease associated with damage to the joint cartilage and surrounding tissue.<sup>1</sup> Osteoarthritis can affect all types of joints, but generally affects the knee, hip, hand, spine and leg joints. The main clinical features of OA are pain, stiffness and limited joint motion.<sup>2</sup> This disease is characterized by the presence of prone abrasion of the joints and the presence of irregular new bone formation on the joint surface. Pain becomes the main major symptom in joints that suffer from osteoarthritis. Pain caused after doing activities with the use of joints and pain can be alleviated by rest.<sup>3</sup>

Osteoarthritis is one of the most common forms of arthritis affecting about 15% of the world's population. Osteoarthritis usually affects the supporting joints of the body such as the knee.<sup>4</sup> According to the National Health and Nutrition Examination Survey III (NHANES III) that 37% of osteoarthritis affects the knee joint.<sup>5</sup> Genu osteoarthritis is a major cause of morbidity, impaired physical activity and reduced quality of life, especially in a age above 45 years, and has a significant impact on social and economic life.<sup>6</sup> In 2014 OA was ranked as eleven diseases in the world that can disrupt daily activities and become a major problem in the global health system.<sup>7</sup> According to the world health organization (World Health Organization), the prevalence of osteoarthritis sufferers in the world in 2004 reached 151.4 million. In western countries such as America and Europe the prevalence of osteoarthritis reaches 22.3 million and 40.2 million, while in Southeast Asia the prevalence reaches 27.4 million. By 2030, the prevalence of osteoarthritis in the United States is estimated to increase to 67 million cases.<sup>8</sup> At ages between 65-74, 39% of men and women describe osteoarthritis in the knee and 23% describe osteoarthritis in the pelvis. At the age of 75 years, about 100% of men and women have symptoms of osteoarthritis. The incidence of osteoarthritis in Norway in 2008, 80% were over 55 years old. The overall prevalence of osteoarthritis in Norway is 12.8% and is higher in women (14.7%) compared to men (10.5%). The prevalence of pelvic osteoarthritis is 5.5%, knee osteoarthritis is 7.1% and hand osteoarthritis is 4.3%.<sup>2</sup> Osteoarthritis (OA) is a degenerative disease that is chronic and runs progressively slowly. This disease causes only mild inflammation, usually characterized by the formation of new bone on the surface of the joint.<sup>9</sup> Knee osteoarthritis is a musculoskeletal disorder that is most commonly found throughout the world, affecting 30-40% of the population at the age of 65 years.

In the United States, OA affects nearly 21 million people and OA sufferers need 1 day out of every 8 days to reduce their activity among the elderly population. While the data in the Medical Rehabilitation Installation of RSUPN Dr. Cipto Mangunkusumo during the period of January - December 2000 showed that 503 of the visitors were OA sufferers and 316 (62.8%) of these OA sufferers affected the knee joint, 76% of them were women and most were over 55 years old. Elderly people in Indonesia who suffer from disabilities due to osteoarthritis are estimated at two million. The prevalence of osteoarthritis aged 49-60 years in Malang reaches 21.7%, which consists of 6.2% men and 15.5% women. The incidence of osteoarthritis increases with age with evidence in x ray imaging. The occurrence of osteoarthritis itself is influenced by several factors including age, genetic, obesity, joint injury, occupation, sports, anatomical anomalies, metabolic diseases, and inflammatory joint disease. Osteoarthritis is included by the World Health Organization (WHO) into one of the of the four muscular and bone conditions that burden individuals, the health system and the social care system at a considerable cost. Worldwide it is estimated that 9.6% of men and 18% of women over the age of 60 suffer from OA.<sup>10,11</sup>

Osteoarthritis ranks second in the world after cardiovascular disease as a cause of physical disability (such as walking and climbing stairs) in the western world. In Indonesia, 34.3 million people in 2002 and 36.5 million people in 2007. The prevalence of OA reached 5% at age <40 years, 30% at age 40-60 years, and 65% at age > 61 years . These cases will continue to increase due to increased life expectancy, obesity (obesity) smoking habits and heavy work.<sup>11</sup> The prevalence of radiological knee osteoarthritis in Indonesia is quite high, reaching 15.5% in men, and 12.7% in women. Osteoarthritis patients usually complain of pain when doing activities or if there is loading on the affected joint. To a greater degree the pain can be felt continuously so that it greatly interferes with the patient's mobility. Because of its high prevalence and its chronic-progressive nature, osteoarthritis has a large socio-economic impact, both in developed and developing countries. An estimated 1 to 2 million elderly people in Indonesia suffer from disabilities due to osteoarthritis. In the coming century the challenges to the impact of osteoarthritis will be greater because of the increasing number of aging populations.<sup>12-15</sup>

Lequesne in 1987 submitted an algofunctional index / Lequesne index questionnaire for knee and hip joints to provide pain values and functional status in daily life without objective

function. Lequesne index has the advantage of being easily and quickly used to assess the results of new drug studies without objective evidence and can be used to follow OA for a long period of time.

## **Methods**

This study is a diagnostic test to assess the suitability of the sensitivity and specificity of the lequesne index to the radiological features according to Kellgren-Lawrence. The subjects of the study were all patients with genu osteoarthritis who went to RSUP Dr. Moh Hoesin, Palembang, who met the inclusion criteria. Inclusion criteria were all patients diagnosed with osteoarthritis genu, aged 50 years or older, patients could understand the research procedure and were willing to sign informed consent. Exclusion criteria were that the patient had surgery on the knee joint (total knee, arthroscopy, arthrodesis, arthroplasty, osteotomy).

The degree of severity according to the lequesne index and the radiological description of the Kellgren-Lawrence criterion are then calculated sensitivity, specificity, positive predictive value, negative expected value and suitability of the lequesne index with respect to. radiologic description of the Kellgren-Lawrence criteria.

## **Results**

A total of 22 respondents (62.9%) experienced severe severity once followed by 10 respondents (28.6%) experienced very severe severity, 2 respondents experienced moderate severity as much as 2 respondents (5.7%) and 1 respondent (2, 9%) experienced mild severity.

**Table 1. Frequency distribution of research subjects according to the Leuquesne Index**

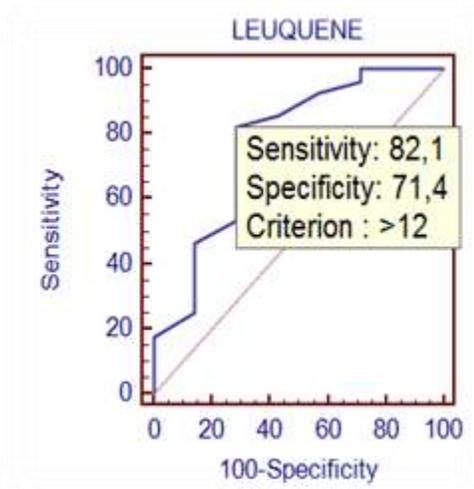
Leuquesne Index	Frequency (n)	Percentage (%)
Mild	1	2,9
moderate	2	5,7
severe	10	28,6
Very Severe	22	62,9
<b>Total</b>	<b>35</b>	<b>100</b>

The highest grade Kellgren Lawrence (KL) radiological picture with 15 respondents (42.9%) was grade 3 followed by grade 2 by 13 respondents (37.1%) grade 1 by 5 respondents (14.3) and the lowest value was at grade 0 group of 2 respondents (5.7%).

**Table 2. Frequency distribution of research subjects according to Kellgren Lawrence**

Kellgren Lawrence	Frequency (n)	Percentage (%)
Grade 0	2	5,7
Grade 1	5	14,3
Grade 2	13	37,1
Grade 3	15	42,9
<b>Total</b>	<b>35</b>	<b>100</b>

In determining the accuracy value of the Leuquesne index against the radiological picture of Kellgren Lawrence Grading, it is necessary to interpret the calculation using a 2x2 table where sensitivity ( $a / (a + c)$ ), specificity ( $d / (b + d)$ ), positive predictive value ( $a / (a + b)$ ) and negative predictive value ( $d / (c + d)$ ) In this study, we used the Receiver Operating Characteristic (ROC) curve to determine the cut off point used to determine these values. X ray imaging was expressed with the Y axis ordinal, the specificity value of the leuquesne index against the radiologic imaging is expressed with the X axis. Based on research data from 35 respondents using the ROC curve we found a cut point of 12 which means the value  $> 12$  is we stated there is a value  $< 12$  we stated no So we get a sensitivity result of 82.1% and a sensitivity of 71.4% with a cut off of 12.



**Figure 1. ROC Curve Analysis**

**Table 3. Accuracy Test of the Leuquesne Index to the Radiological Imaging**

		Radiologic Criteria	
		<i>Yes</i>	<i>No</i>
Leuquesne Index	>12	23	2
	<12	5	5
Total		28	7

Based on the table above we get a sensitivity value of 82.14%, specificity 71.42% positive predictive value 92%, negative predictive value 52% and the suitability value of the Leuquesne index against the radiological features 0.8 (very good  $\geq 0.8$ ).

**Discussion**

A total of 23 respondents experienced the severity of OA genu based on the Lequesne index, the severity of the severity and severity, while radiological features with grade 2 and grade 3 severity were expressed with a sensitivity value of 82.14%, indeed really sick or severe. A total of 5 respondents experienced mild and moderate severity at the values of the Lequesne index and grades 1 and 0 on the radiological features expressed with a sensitivity value of 71.42% which means that patients were not sick or mild severity. A total of 2 respondents were the severity of

the leuquesne index with a very severe and severe severity while radiological features in grade 0 and grade 1 stated a positive predictive value of 92% where patients with OA were very severe and very severe there were 8% which did not show grade 2 or grade 3 on radiologic features. a negative predictive value is 5 respondents the severity of the leuquesne index is mild and in radiological features grade 2 and grade 3 by 50% this states that patients with mild severity of 50% sufferers do not show grade 0 or grade 1.

Then based on existing data the suitability value of the leuquesne index to the radiological picture is very good at 0.8 (80%) where the severity of patients with osteoarthritis of the knee from the lequesne index matches the grading of the severity of knee osteoarthritis by radiological examination.

So from the results of the study with a sensitivity value of 82.14%, specificity 71.42%, the lequesne index can be used as screening for examination of genu osteoarthritis and further Follow up in treatment.

## **Conclusion**

The sensitivity value of the Lequesne index to the radiological picture was 82.14%, specificity 71.42%, positive predictive value 92% and negative predictive value 50%. Leuquesne index can be used as a screening examination in patients with osteoarthritis of the knee.

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