Evaluation of the uric acid and hematological parameters in patients with nodal hand osteoarthritis

Ayşe Ünal Enginar

Department of Rheumatology, Konya City Hospital, Konya,Turkey

ABSTRACT

Objectives: To compare patients with symptomatic nodal hand osteoarthritis (OA) with a control group in respect of inflammation parameters, uric acid, and hematological parameters.
Methods: The study included 50 post-menopausal female patients, aged 40-80 years, diagnosed with symptomatic nodal hand OA, and a control group of 50 post-menopausal females in the same age range with no hand OA. Patient data including age, monocyte, neutrophil, lymphocyte, and thrombocyte counts, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) level, uric acid level, and the Kellgren-Lawrence (KL) score obtained from evaluations of hand radiographs, were recorded retrospectively from the hospital information system. The neutrophil-lymphocyte ratio (NLR), platelet-lymphocyte ratio (PLR), and monocyte-lymphocyte ratio (MLR) were calculated. The data were compared between the two groups.
Results: The data of 100 females were compared, comprising a patient group of 50 patients with symptomatic nodal OA, and a control group of 50 females. Age, monocyte, neutrophil, lymphocyte, and thrombocyte counts, NLR, PLR, MLR, ESR, CRP, and uric acid level were compared. With the exception of MLR and ESR, no statistically significant difference was determined between the two groups. The MLR was determined to be statistically significantly higher in the control group than in the patient group ($p = 0.024$). The ESR was determined to be statistically significantly higher in the patient group than in the control group ($p < 0.001$). When patients with a KL score of 2 and 3 were compared, with the exception of age, no other difference was determined. Patients with a KL score of 3 were seen to be significantly older ($p = 0.032$).
Conclusions: ESR was determined to be significantly higher in patients with symptomatic nodal OA. Clarification of the relationship between inflammation, uric acid, and hand OA, which is a heterogeneous disease, will be useful in the follow-up and treatment of patients.
Keywords: Hand osteoarthritis, monocyte-lymphocyte ratio, neutrophil–lymphocyte ratio, uric acid, erythrocyte sedimentation rate, C-reactive protein

Osteoarthritis (OA) is the most commonly seen joint disease worldwide. The frequency of OA is increased together with an increase in obesity and age-ing [1]. The hand is one of the most frequently in-volved areas, and hand OA is seen more often in females [2]. In the Framingham study, the incidence of radiographic hand OA was determined to be 34%, and the incidence of symptomatic hand OA was 7% [3]. Symptoms may be in the form of pain, stiffness, restricted movement, and decreased grip strength.

Hand OA is a heterogenous disease [4]. Obesity and genetic factors are significant risk factors for hand OA [5]. Hand OA can be separated into subgroups of first carpometacarpophalangeal joint OA, erosive joint OA, and nodal hand OA. In the subgroup of nodal OA, there may be nodules in the distal interphalangeal and proximal interphalangeal joints. These nodules are named Heberden and Bouchard nodules, respectively [2]. Mechanical, inflammatory, and metabolic factors are involved in the pathogenesis of OA. In the light of new information about the pathogenesis in the last 10 years, OA is now defined as a multifactorial diseases characterised by low-grade chronic inflammation, rather than as a degenerative disease which progresses with wear and destruction.

Unlike rheumatoid arthritis, there is chronic, low-grade inflammation mediated by the immune system from birth [6, 7]. There is no specific laboratory test for OA, although the erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) level may be slightly increased in OA patients. This is more evident in patients with erosive hand OA [8]. There are few studies related to the parameters of uric acid [9, 10], neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) in OA, and these studies have been conducted more on patients with knee OA [11-13].

The aim of this study was to evaluate these parameters, which are often used in daily practice, in patients with symptomatic nodal hand OA.

METHODS

The study included 50 post-menopausal females in the age range of 40-80 years, who presented at the Rheumatology Clinic between January and May 2022, and were diagnosed with symptomatic nodal hand OA according to the American College of Rheumatology (ACR) hand OA classification criteria. A control group was formed of 50 post-menopausal females in the age range of 40-80 years, with no hand OA. Patient data including age, monocyte, neutrophil, lymphocyte, and thrombocyte counts, ESR, CRP level, uric acid level, and the Kellgren-Lawrence (KL) score obtained from evaluations of hand radiographs, were recorded retrospectively from the hospital information system. The NLR, PLR, and monocyte-lymphocyte ratio (MLR)

were calculated.

Patients and control subjects were excluded from the study if they were pregnant, had any malignant disease, active infection, erosive hand OA, rheumatoid arthritis, psoriasis, psoriatic arthritis, gout, chondrocalcinosis, chronic liver or kidney disease, were using diuretics, or had any trauma-related deformity or contracture in the hand joints.

The study protocol was approved by the Ethics Committee of Necmettin Erbakan University Faculty of Medicine (Decision number 2022/3849).

Statistical Analysis

The SAS version 9.4 was used for statistical analysis. While evaluating the study data, descriptive statistics, including the mean, standard deviation, median, frequency, ratio, minimum and maximum values were obtained. The Kolmogorov- Smirnov test was conducted to check the normality distribution of independent data. Since the data were found to be non-normally distributed, the independent mann Whitney U test was used for the comparative analysis. The chisquare test was used for the analysis of qualitative independent data. Pearson correlation coefficient (rs) was used for correlations between parametric data.Statistical significance was accepted as $p < 0.05$.

RESULTS

The findings of 100 females were compared, comprising a patient group of 50 patients with symptomatic nodal OA, and a control group of 50 females. Age, monocyte, neutrophil, lymphocyte, and thrombocyte counts, NLR, PLR, MLR, ESR, CRP, and uric acid level were compared. With the exception of MLR and ESR, no statistically significant difference was determined between the two groups. The MLR was determined to be statistically significantly higher in the control group than in the patient group ($p = 0.024$). The ESR was determined to be statistically significantly higher in the patient group than in the control group ($p < 0.001$) (Table 1). When patients with a KL score of 2 and 3 were compared, with the exception of age, no other difference was determined. Patients with a KL score of 3 were seen to be significantly older ($p = 0.032$) (Table 2).

Table 1. Relationship of blood parameters between osteoarthritis patients and the control group

	Groups		
	Patient (n = 50) Median (IQR) n (%)	Control (n = 50) Median (IQR) n (%)	*p* value
Age (years)	65.0 (60.0-68.0)	61.5 (59.0-65.0)	0.13
Neutrophil (× 10^9/L)	3.5 (3.0-5.1)	3.9 (3.2-4.8)	0.64
Lymphocyte (× 10^9/L)	2.3 (2.1-3.0)	2.4 (1.9-2.9)	0.59
Monocyte (× 10^9/L)	0.6 (0.5-0.7)	0.6 (0.6-0.8)	0.13
Platelet (× 10^9/L)	241.5 (202.0-293.0)	275.0 (225.0-323.0)	0.06
NLR	1.5 (1.3-2.0)	1.7 (1.4-2.0)	0.24
PLR	100.9 (85.5-120.9)	109.6 (91.5-140.5)	0.05
MLR	0.2 (0.2-0.3)	0.3 (0.2-0.3)	**0.024**
Uric acid (mg/dL)	4.6 (3.7-5.9)	4.4 (3.1-5.5)	0.12
ESR (mm/h)	20.5 (16.0-26.0)	7.5 (3.0-18.0)	**< 0.001**
CRP (mg/dL)	2.0 (1.3-3.0)	2.4 (1.5-3.6)	0.45
KL score			
Grade 2	43 (86.00)	00 (0.00)	
Grade 3	07 (14.00)	00 (0.00)	

NLR = neutrophil-lymphocyte ratio, PLR = platelet-lymphocyte ratio, MLR = monocyte-lymphocyte ratio, ESR = erythrocyte sedimentation rate, CRP = C-reactive protein, KL = Kellgren-Lawrence

Table 2. Comparison of KL score

	KL score		
	Grade 2 (n = 43) Median (IQR)	Grade 3 (n = 7) Median (IQR)	*p* value
Age (years)	64.0 (58.0-67.0)	68.0 (66.0-73.0)	**0.032**
Neutrophil (× 10^9/L)	3.5 (3.0-5.1)	3.9 (3.5-5.2)	0.20
Lymphocyte (× 10^9/L)	2.3 (2.1-3.0)	2.3 (2.1-3.0)	1.00
Monocyte (× 10^9/L)	0.6 (0.5-0.7)	0.7 (0.5-0.8)	0.39
Platelet (× 10^9/L)	235.0 (200.0-292.0)	284.0 (234.0-333.0)	0.14
NLR	1.5 (1.3-2.0)	1.8 (1.0-2.2)	0.62
PLR	100.9 (85.4-118.6)	104.0 (94.2-149.3)	0.29
MLR	0.2 (0.2-0.3)	0.3 (0.2-0.3)	0.39
Uric acid (mg/dL)	4.7 (3.7-5.9)	4.5 (3.7-5.8)	0.98
ESR (mm/h)	20.0 (15.0-25.0)	22.0 (18.0-29.0)	0.17
CRP (mg/dL)	2.1 (1.3-3.0)	1.9 (1.2-4.5)	0.82

KL = Kellgren-Lawrence, NLR = neutrophil-lymphocyte ratio, PLR = platelet-lymphocyte ratio, MLR = monocyte-lymphocyte ratio, ESR = erythrocyte sedimentation rate, CRP = C-reactive protein

DISCUSSION

The results of this study demonstrated that ESR was higher and the MLR was lower in females with nodal hand OA. In a study by Gao *et al.*, it was reported that the MLR could be diagnostic in patients with knee OA. Patients with a KL score of grade 3 and 4 were included and the MLR was determined to be statistically significantly higher in patients at KL grade 4 compared to those at grade 3 [11]. The current study examined patients with hand OA and KL score of grade 2 and 3, but the greater number of patients with grade 2 could have affected the results. Shi *et al.*[12] reported that PLR could show inflammation in knee OA. In another study, no relationship was determined between NLR and symptomatic knee OA [13]. In the current study, no difference was determined between the patients and the control group in respect of NLR and PLR.

In a previous meta-analysis, high-sensitive CRP (hsCRP) levels were determined to be at a moderately high level in patients with OA. A relationship was determined between hsCRP and clinical symptoms such as pain and function loss, but no correlation was determined between hsCRP and the KL score [15].

In another study that included 694 patients with hand OA, no relationship was determined between radiographic OA and inflammatory biomarkers [16]. Levels of hsCRP have been determined to be significantly higher in patients with erosive OA compared to patients with non-erosive OA [17]. A correlation has been shown between pain and higher body mass index (BMI) in patients with hand OA, and it has been reported that low-grade inflammation measured with hsCRP could be associated with pain in obese patients [18]. In a study of patients with advanced stage knee and /or hip OA, the CRP level was reported to be higher in females and elevated CRP was found to be correlated with joint pain [19]. Another study reported that ESR and the hsCRP level in patients with knee OA were higher than in patients without knee OA [20]. Erosive OA patients were compared with non-erosive OA patients in another study, and ESR and CRP levels were found to be higher in the non-erosive group [21]. In the current study, although ESR was found to be higher in the patients than in the control group, no sig-

nificant difference was determined in respect of CRP. However, most previous studies have used hsCRP, and this difference could be related to that.

There are studies in literature which have aimed to understand the relationship between OA, uric acid, and gout, but this relationship has not yet been clearly explained. The combination of gout and OA is known. It is thought that hyperuricemia could lead to the progression of OA, or there could be a two-way relationship between a predisposition to the development of gout in a joint with OA [22, 23].

Ding *et al.* [9] reported that there was a relationship between hyperuricemia and osteophytes in females with knee OA. In another study of 71 patients with knee OA, more abnormalities were observed on MRI in those with high levels of serum uric acid [10]. From a study in which patients with knee OA and no gout were followed up for 24 months, there was observed to be greater narrowing of the joint space in those with a high level of uric acid [24]. In another cohort study, no significant relationship was determined between tibiofemoral cartilage loss seen on MRI and serum uric acid level [25]. Uric acid can activate NLRP3 (Nacht, leucine-rich repeat and pyrin domain containing protein 3) and as a result, IL-18 and IL-1β levels increase. In a study that analyzed the synovial fluid of patients with knee OA and no gout, increased IL-18 and IL-1β levels were found to be corrrelated with the serum uric acid level. This was determined radiographically and scintigraphically to be related to the severity of knee OA [26]. It has been reported that while uric acid at low concentrations is chondroprotective and anti-inflammatory [27], at high levels it can trigger OA. Therefore, it may play an antioxidant or pro-oxidant role [289. In the current study, uric acid was determined at a higher level in the OA patients than in the control group, but the difference was not determined to be statistically significant, and no difference was determined between patients with KL score of 2 and 3.

Limitations

Limitations of this study can be said to be that it was conducted in a single centre, the number of patients was relatively low, and comorbidities were not reported.

CONCLUSION

In conclusion, the results of this study demonstrated that the ESR was significantly higher in patients with symptomatic nodal hand OA compared to the control group. However, as hand OA is a heterogenous disease, there is a need for further studies related to uric acid and inflammation parameters.

Authors' Contribution

Study Conception: AUE; Study Design: AUE; Supervision: AUE; Funding: AUE; Materials: AUE; Data Collection and/or Processing: AUE; Statistical Analysis and/or Data Interpretation: AUE; Literature Review: AUE; Manuscript Preparation: AUE and Critical Review: AUE.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

Financing

The authors disclosed that they did not receive any grant during conduction or writing of this study.

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