

Pre-operative mean corpuscular volume, red cell distribution width and neutrophil-to-lymphocyte ratio in patients with enchondroma

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ABSTRACT

Enchondromas are benign, solitary bone tumors originating from hyaline cartilage, that are usually located in the upper and lower extremities. They are equally distributed in both genders and in all age groups. 40-65% of enchondromal cases are found in metacarpal bones. The most common involvement is the proximal phalanx, metacarpal bone, and distal phalanx. Involvement of distal phalanx in patients with enchondroma is rare. Our aim in this study was to investigate the pre-operative neutrophil count, white blood cell count, red cell distribution width, mean corpuscular volume, platelet count, hemoglobin, hematocrit and NLR values, and make a comparison with a control group. The most commonly involved sites are also investigated in the patient group.

This retrospective study investigated the preoperative WBC, neutrophil, lymphocyte, RDW, MCV, NLR values in 20 patients and 20 controls, and compared the frequency of the involved sites among patients with enchondroma.

WBC, neutrophil count, MCV, RDW were not found statistically significant. NLR ratios were different between groups, but not statistically significant. Involvement of the proximal phalanx was statistically significantly higher ($p < 0.05$).

This is the first study investigating the pre-operative RDW, MCV, NLR, PLT, Hgb, Hct and WBC in patients with enchondroma. Although there is no statistically significant difference when these results are compared we suggest that they should be studied in larger groups and in clinical tests, so that the malignancy potential may be predicted.

Key Words: Enchondroma, neutrophil-to-lymphocyte ratio, mean corpuscular volume, leukocyte count red cell distribution width

Introduction

Enchondromas are benign bone tumors originating from hyaline cartilage. These intra-medullary cartilage lesions are believed to be hamartomatous remnants of the growing plate (1,2). They are solitary lesions located usually in the upper and lower extremities (3,4). While 40-70% of patients with enchondroma are localized in the hands and small bones in the legs, 25% of the cases are seen in long tubular bones (5,6).

Diagnosis is usually made based on the presence of a painful or painless swelling, a pathological fracture or an incidental radiological finding (7-9). These lesions are usually followed-up with conservative methods. When surgery is indicated, curettage and filling the space with bone graft or supportive materials are performed (5).

This retrospective study compared the pre-operative blood values hematocrit (Hct), hemoglobin (Hgb), white blood cell (WBC), platelet (PLT), red cell distribution width (RDW),

mean corpuscular volume (MCV), and the neutrophil/lymphocyte ratio (NLR)] between patients with enchondroma and the control group, and also investigated the location of the tumor in the patient group. Patients who had an inflammatory disease, diabetes, steroid use, alcohol use or who smoked were excluded from the study group.

Material and methods

Study Plan: The patients who had been diagnosed with enchondroma at the Orthopedics and Traumatology Clinic of Medical School, Van Yuzuncu Yil University between 2010-2017, were retrospectively evaluated with regard to age, gender, tumor location, pre-operative Hgb, Hct, RDW, MCV, WBC, neutrophil count and the NLR values and compared with control group. The data were collected from the patient files.

Each group was composed of 20 patients. Data regarding the involvement site and the pre-

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operative blood values were obtained from the patient files. The main reasons for admission were determined as pain, restricted movement and swelling of the finger. Patients with diabetes mellitus, hypertension, infectious diseases, pulmonary diseases, those who smoked, those who used steroids and alcohol were excluded from the study. Twenty healthy individuals with no known systemic diseases, who did not smoke or drink alcohol were selected as controls.

MCV, RDW and NLR: The blood count was assessed by means of a Beckman-Coulter, LH 780, USA instrument. White blood cell, neutrophil, lymphocyte and platelet counts, RDW and MCV values were taken from this device. The MCV values were measured from the blood parameters

collected in the EDTA tube while the NLR values were calculated by obtaining the neutrophil / lymphocyte ratio of the values from the blood samples.

Results

The mean age was 24.7± 11.26 years for the patient group and 24 ± 16.38 years for the control group. There was similarity between groups according to age and sex (p>0.05) (Table 1). Although the number of neutrophils, lymphocytes, NLR, RDW and PLT were higher in the patient group, no statistically significant difference was found (p>0.05) (Table 1).

Table 1. Demographic and clinical parameters of the patients with enchondroma and healthy subjects (values are expressed as mean ± standard deviation)

Parameters	Study group (n=20)	Control group (n=20)	p value
Age (years)	24.7±11.26	24±16.38	0.87
Gender (female/male)	9/11	10/10	0.75
PLT count (x103/mm3)	255.83±78.70	303.90±174.48	0.29
MCV (fl)	83.36±5.68	84.31±7.07	0.65
ANC (cell/mm3)	5.64±1.95	7.36±4.43	0.13
ALC (cell/mm3)	2.26±0.87	2.33±1.06	0.84
RDW (%)	13.63±1.26	14.29±1.45	0.14
NLR (%)	2.72±1.11	3.61±2.65	0.18
WBC (/µl)	8.74±2.19	9.73±4.90	0.43
Hgb	13.75±1.99	12,82±2.30	0.19
Hct	40.92±5.92	39.45±7.73	0.51

Abbreviations: PLT: platelet, MCV: mean corpuscular volume, ANC: absolute neutrophil count, ALC: absolute lymphocyte count, RDW: red cell distribution width; NLR: neutrophil to lymphocyte ratio; WBC: white blood cell, Hgb: hemoglobin, Hct: hematocrit

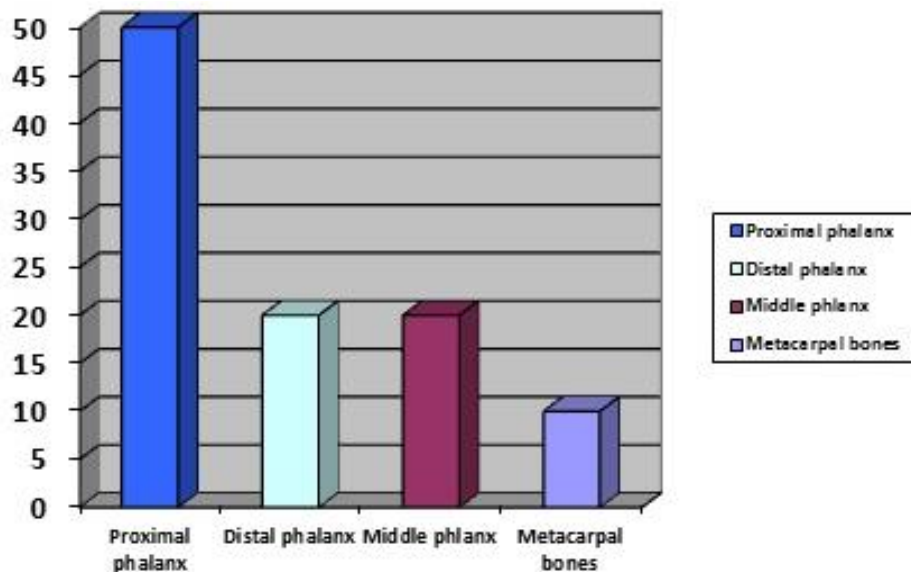


Fig. 1. Distribution of involvement in the hand.

The proximal phalanx was determined to be the most commonly involved site (Figure 1).

Statistical analysis: Independent sample t-test was used to compare the parameters of the blood tests and the age and sex of the patients. Chi-square test was used for the localization of the enchondroma in the hand bones. Student's t tests were used to compare the parameters. The results were evaluated as mean \pm standard deviation. The results were accepted as significant when p values less than 0.05. Statistical Package Program for Social Sciences (SSPS) was used for statistical analysis.

Discussion

When we checked the literature, we thought that these blood values are the first to study preoperatively in patients with enchondroma. Although this parameter in the complete blood count was higher in the patient group, it did not seem to be statistically significant.

Enchondroma is a benign tumor of the hyaline cartilage. The lesions are commonly located within the bone. While the vast majority of the tumors are solitary, more than one bone or more than one location in one bone may rarely be involved (10). Enchondromas are distributed almost equally in both gender and in each age group (4). 40-65% of the cases are seen in the small tubular bones of the hands, most frequently in the proximal phalanx, metacarpal bones, middle phalanx and rarely in distal phalanx (11). They are seen in the middle and distal parts of the metacarpal bones and more in proximal part of phalanges. The tubular bones of the feet are involved seven-fold less frequently than the hand. Enchondromas are almost never seen in the carpal or the tarsal bones. While most of the enchondromas may be seen in the femur, humerus, tibia, radius, ulna and fibula are rarely involved, and flat bones are involved very rarely too (12).

Our study has revealed that involvement of the proximal phalanx is statistically significantly higher than the middle phalanx, distal phalanx and metacarpal bone ($p < 0.05$) (Table 2).

When the patients were investigated with regard to the involvement site in the hand, proximal phalanx involvement was determined to be statistically significantly higher than involvement of the middle phalanx, distal phalanx and the metacarpal bones ($p < 0.05$) (Figure 1).

A potential relationship between systemic inflammation and malignancy development has gained great importance in recent studies (13).

Table 2. Comparison of the patients with regard to lesion localization in the hand

Localization	Frequency	Percent (%)	p value
Proximal phalanx/ Distal phalanx	10 4	50.0 20.0	0.036
Proximal phalanx/ Middle phalanx	10 4	50.0 20.0	0.036
Proximal phalanx/Metacarpal bones	10 2	50 10	0.002

Although the exact mechanism is not known, some hypotheses have been proposed. Tumor-related inflammation may lead to increased level of cytokines, inhibition of apoptosis and increased angiogenesis. Tumor cells increase the granulocyte colony-stimulating factor (G-CSF) release, which triggers the increase in neutrophil count. Neutrophils play a role in tumor angiogenesis through producing pro-angiogenic factors such as vascular endothelial growth factor, matrix metalloproteinase, interleukin-8 and elastases (14-18). While these cytokine species contribute to tumor growth and metastases, lymphocytes have a significant role in tumor suppression (19). Increased lymphocyte count is known as a positive factor in colorectal cancer, breast cancer and melanoma (20-22). Both increased neutrophil count and decreased lymphocyte count may lead to increased NLR, which has been reported to a prognostic factor in many cancer types. Leukocyte migration is important in the physiological immune response and accompanies systemic changes triggered by circulating cytokines and chemokines. These changes may lead to increased neutrophil and platelet count and decreased lymphocyte count. These changes have been proposed to have an important role in growth, progression and metastasis of the neoplasm (23). Neutrophilia may develop as a result of infection accompanied by para-neoplastic myeloid growth factors or cancer-related inflammation (24). Lymphocytes have an important role in defense against tumor through induction of cell death via the immune response. Lymphopenia is frequently seen in developed cancers and this is an indicator of a suppressed immune response due to cancer (25). Therefore, neutrophilia and lymphopenia may be erroneous due to cancer progression. Elevated NLR may result from the systemic inflammatory response due to cancer, which could lead to neutrophilia and lymphocytopenia (26). High WBC may be directly related to

inflammation, especially in cardiovascular diseases (27).

NLR is nowadays defined as a marker of inflammation and is used as an index in cancer diagnosis and treatment (28,29). Elevated NLR is a prognostic factor in many cancer types (30,31).

Kum et al. have shown that NLR was significantly elevated in laryngeal cancer when they compared benign and malignant lesions (32). Although high NLR values are defined as poor prognosis in some types of cancer, some conflicting studies also exist (33-35). Preoperative elevated NLR may be correlated with poor survival expectation, advanced stage cancer, poor prognosis and inflammation (36). Several studies have reported that NLR is an significant predictor for coronary artery disease, acute coronary syndrome, heart failure and diabetic nephropathy (37). A meta-analysis by Paramanathan et al. has indicated that elevated NLR is associated with a poor prognosis in patients with solid tumors (14). Wang et al. have determined that increased NLR (>3) is related a poor prognosis in patients who have bone metastases (38).

Our study has not revealed a significant difference between the patient and the control groups with regard to NLR. This result may be associated with the small number of patients. Furthermore, enchondroma may not have affected the inflammatory parameters due to being a chronic disease, which progresses slowly. NLR has been used as a prognostic factor in recent studies. We suggest that NLR may be used as an inexpensive, non-invasive method for malignant transformation of enchondroma due to the potential for malignant transformation, although very rare. The NLR value may be useful for clinicians for this rare and insidious condition. Further studies with larger series are required for better understanding this issue.

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