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Neutrophil to lymphocyte ratio of patients who underwent bilateral versus unilateral unicompartmental knee arthroplasty

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Abstract

In recent years, the neutrophil-to-lymphocyte ratio (NLR) has emerged as a sensitive index of systemic inflammation. NLR predicts serious complications, such as pulmonary embolism or cardiovascular disease risk. Our study aims to compare the inflammation rate of bilateral simultaneous UKA versus unilateral UKA by using NLR. The medical records of 27 patients who underwent unicompartmental knee arthroplasty were reviewed retrospectively. The patients were divided into two groups. Group 1 consisted of 10 patients who underwent bilateral simultaneous UKA (bUKA), whereas group 2 consisted of 17 patients who underwent unilateral UKA (uUKA). Preoperative and postoperative 1st hour blood chemistries were performed and results were extracted from the electronic database. The neutrophil-to-lymphocyte ratio (NLR) was calculated from the absolute neutrophil and lymphocyte counts. The mean preoperative and postoperative NLR and the difference in NLR between the preoperative and postoperative 1st hour was calculated. The mean preoperative NLR was 2.13 (0.51-4.54), and the mean postoperative NLR was 7.06 (0.50-15.33) in the uUKA group. NLR was significantly higher in the postoperative 1st hour ($p=0.001$). In the evaluation of the bilateral group (bUKA), the mean NLR was calculated as 1.61 preoperatively and 9.38 postoperatively. Hence, there was a statistically significant difference ($p=0.001$). The mean difference in NLR was 7.77 in Group 1 and 4.92 in Group 2. Although the increase in NLR was higher in Group 1, no statistically significant difference was found ($p=0.547$). Our findings revealed similarly increased rates of NLR in the bilateral and unilateral UKA groups. Our study may suggest that bilateral simultaneous application of UKA is a safe procedure in terms of NLR-associated complications.

Keywords: Neutrophil to lymphocyte ratio, unicompartmental, knee arthroplasty

Introduction

Total knee arthroplasty (TKA) and unicompartmental knee arthroplasty (UKA) are proven procedures for the treatment of advanced gonarthrosis. There has been significant debate about the safety of bilateral total knee arthroplasty since it was first described [1-3]. It was shown that bilateral simultaneous TKA has the advantage of not increasing the rate of perioperative complications [4]. However, some studies have reported increased perioperative complication rates, including pulmonary embolism and major cardiac events [5,6].

UKA has a quicker functional recovery than TKA and has advantages such as smaller incision and less blood loss [7].

Numerous studies have compared the safety of simultaneous versus staged unicompartmental knee arthroplasty [8-11] or simultaneous bilateral versus unilateral UKA [12]. In recent years, the neutrophil-to-lymphocyte ratio (NLR) has emerged as a sensitive index of systemic inflammation. NLR predicts serious complications, such as pulmonary embolism or cardiovascular disease risk [13]. Deviations in the NLR are also apparent with contrasting arthroplasty procedures, suggesting that the NLR could serve as an indicator for systemic inflammation [14]. Complete blood cell count is one of the simplest and most readily available tests in clinics. It reports the absolute neutrophil count (ANC) and absolute lymphocyte count (ALC). The neutrophil-to-lymphocyte ratio (NLR), calculated by dividing the ANC by the ALC, can serve as an index of systemic inflammatory response in critically ill patients [15]. Also, the neutrophil-to-lymphocyte ratio (NLR) is developing as a clinical tool that predicts venous thromboembolism risk [13,16,17]. Our study aims to compare the inflammation rate of bilateral simultaneous UKA versus unilateral UKA by using NLR.

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Material and Methods

The medical records of 27 patients who underwent unicompartmental knee arthroplasty were reviewed retrospectively (Zimmer Biomet, Oxford® Partial Knee, Biomet UK Limited). The patients were

divided into two groups. Group 1 consisted of 10 patients who underwent bilateral simultaneous UKA (bUKA) whereas Group 2 consisted of 17 patients who underwent unilateral UKA (uUKA) (Figure 1, 2).



Figure 1. Postop X-ray of a patient who underwent bilateral simultaneous unicompartmental arthroplasty (bUKA)

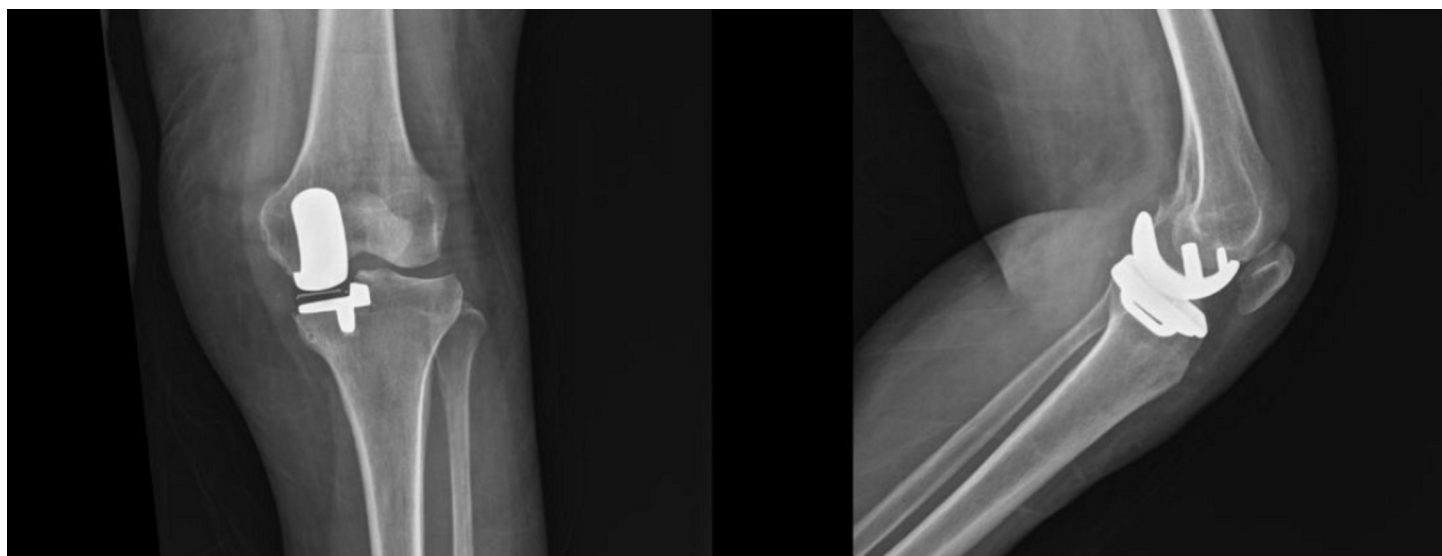


Figure 2. Postop X-ray of a patient who underwent unilateral unicompartmental arthroplasty (uUKA)

The surgeries were performed between 2016 and 2019. All surgeries were performed by the same surgeon at the same hospital. Cefazolin (1 gr.) and tourniquet were applied in all surgeries. Combined spinal-epidural anaesthesia was performed on both uUKA and bUKA groups. A minimally invasive oblique medial parapatellar approach was used as the surgical technique. No blood transfusions were performed perioperatively. Low molecular weight heparin was used to prevent thromboembolic events after surgery. No complications were observed in any surgery. The following data were collected: age, gender, comorbidities, mean surgical time, neutrophil to lymphocyte ratio, and early complications. Preoperative and postoperative 1st hour blood chemistries were

performed and results were extracted from the electronic database. The neutrophil-to-lymphocyte ratio (NLR) was calculated from the absolute neutrophil and lymphocyte counts. The mean preoperative and postoperative NLR and the difference of NLR between preoperative and postoperative 1st hour was calculated. The mean difference was evaluated for both groups.

The mean, standard deviation, median lowest, highest, frequency and ratio values of the descriptive statistics were used (Table 1). The Mann-Whitney U test was used for statistical analyses. The statistical analysis was performed using SPSS 22.0. A p-value lower than 0.05 was considered statistically significant.

Table 1. The descriptive statistics of the NLR increase

	N*	Range	Minimum	Maximum	Mean	Std. Deviation
Group 1 (bUKA)	10	23.84	-0.11	23.73	7.7730	8.21290
Group 2 (uUKA)	17	13.70	-0.74	12.96	4.9276	4.50627

*N: number of patients

Results

Group 1 consisted of 10 patients and all patients were female. In Group 2, only 1 patient was male, while all other 16 patients were

female. The mean age of Group 1 was 60.7 (55-67), while for Group 2 it was 61.41 (54-68). In the bUKA group, three patients had diabetes mellitus and two patients had hypertension. In the uUKA group, two patients had hypothyroidism, three patients had hypertension, while one patient had diabetes mellitus.

The mean surgical time was 49.8 minutes for the bilateral procedures and 28.29 minutes for the unilateral ones (Table 2).

The mean preoperative NLR was 2.13 (0.51-4.54), and the mean postoperative NLR was 7.06 (0.50-15.33) in the uUKA group. NLR was significantly higher in postoperative 1st hour ($p=0.001$). In the evaluation of the bilateral group (bUKA), the mean NLR was calculated as 1.61 preoperatively and 9.38 postoperatively. There was a statistically significant difference ($p=0.001$) (Table 3).

Table 2. Demographic features of the patients

	Bilateral UKA (Group 1)	Unilateral UKA (Group 2)	p value
Number(N) (female:male)	10 (10:0)	17 (16:1)	
Mean age (years) (range)	60.7 (55-67)	61.41 (54-68)	
Side (R:L)	10:10	8:9	
Mean surgical time (min.) (range)	49.8 (45-55)	28.29 (23-35)	
Mean NLR increase (pre-post 1st h.)	7.7730	4.9276	0.547

The mean difference in NLR was 7.77 in Group 1 and 4.92 in Group 2. Although the increase in NLR was higher in Group 1, no statistically significant difference was found ($p=0.547$) (Table 1).

Table 3. The comparison of preoperative and postoperative 1st hour NLR.

	Preop NLR	Postop 1st h. NLR	p value
Group 1 (bUKA)	1.6150	9.3880	.001
Group 2 (uUKA)	2.1394	7.0671	.001

Discussion

Unicompartmental knee arthroplasty (UKA) is a good option for isolated medial compartment osteoarthritis, even for overweight and obese patients [18]. UKA presents many advantages like short anaesthetic time and reduced length of hospital stay in comparison to TKA [19-22]. Prolonged hospital stay leads to increased morbidity/mortality and significant financial loss [23]. In addition, the rate of infection due to arthroplasty conducted in summer is reported to be higher than other seasons [24].

Simultaneous bilateral surgery is superior to the two-staged procedure as it reduces costs, length of hospital stay and rehabilitation time [8,11]. However, bilateral procedures cause massive blood loss, longer operative times, and increased complication for both TKA [25-28] and UKA [29]. In our study, bUKA was about 20 minutes longer than uUKA and no complications were observed in either group.

In the literature, there are many studies that have reported the

relationship between the neutrophil lymphocyte ratio (NLR) and systemic inflammation [13,14,16,17]. The NLR is a ratio between the absolute neutrophil and lymphocyte counts and it is accepted as a marker of systemic inflammation. In many studies, it was concluded that NLR can be used as a clinical tool for venous thromboembolism (VTE) [13,16,17].

Previous studies have focused on cardiac disease mortality by using NLR [13,30,31].

Knee arthroplasty is known as an independent risk factor for developing VTE [32-34]. In their investigation, Barker et al. [14] concluded that NLR increase is greater in TKA compared to UKA and may be a predictor for VTE after TKA. In our study, there was a higher NLR increase in the bUKA group compared to the uUKA group. Although this increase was not statistically significant.

There are two major limitations of preliminary study. First of all, the groups consisted of a small number of patients and also, the study was designed retrospectively.

Conclusion

Our findings revealed similarly increased rates of NLR in the bilateral and the unilateral UKA groups. Our study may suggest that bilateral simultaneous application of UKA is a safe procedure in terms of NLR and systemic inflammation. In the light of data obtained from further studies to be performed on larger patient series, bUKA may be preferred to uUKA as the increase in inflammation could be similar. Further studies on this subject can encourage surgeons to perform bilateral surgeries for appropriate patients without additional complications.

Competing interests

The authors declare that they have no competing interest.

Financial Disclosure

The authors received no financial support for this study.

Ethical approval

Ethical approval was obtained (University of Kyrenia, 2019/18).

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