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Is there an increased risk of complications in patients diagnosed with COVID-19 six months before total knee arthroplasty?

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Abstract. – OBJECTIVE: We aimed to compare the risk of developing complications between patients who had long-term COVID-19 and those who did not.

PATIENTS AND METHODS: This is a retrospective study involving a total of 265 patients who had undergone total knee arthroplasty surgery. A cohort of patients (Group 1) who had been diagnosed with COVID-19 six months prior to total knee arthroplasty was established and matched to a cohort of patients who had never been diagnosed with COVID-19 (Group 2). Demographic information such as age and gender, underlying diseases, postoperative complications (surgical site infection, wound problem, periprosthetic fracture, deep vein thrombosis, pulmonary thromboembolism, hematoma, pneumonia, urinary tract infection) and exitus were recorded.

RESULTS: Of the 265 patients, 217 (81.9%) were females and 48 (18.1%) were males. 41 of these patients (15.5%) previously had COVID-19 (Group 1). The number of people who did not have COVID-19 was 224 (84.5%) (Group 2). There was no difference between group 1 and group 2 in terms of complications.

CONCLUSIONS: This study found that the rate of complications, including deep vein thrombosis, in patients who had COVID-19 six months before total knee arthroplasty was not higher than those who did not.

Key Words:
COVID-19, Total knee arthroplasty, Complication.

Introduction

COVID-19, which first appeared in China in 2019, has taken the whole world under its influence in a short time. This disease, which has high mortality and morbidity, adversely affects orthopedic patients. Emergency cases were operated while elective cases had to be postponed[1]. During the pandemic, the main purpose was to meet critical patient care needs. For this reason, elective surgical interventions were suspended from the start of the pandemic until the number of cases began to decrease. The most important reasons for suspending elective surgical interventions were to protect patients from contamination and to prevent complications that may occur in the postoperative period[2]. Today, although the pandemic has lost its effect, we know that there are still cases of COVID-19. Arthroplasty is a significant surgical procedure in the field of orthopedics. Total knee arthroplasty (TKA) is applied to severe joint damage. Total knee replacement still remains a valid option for high-grade osteoarthritis with severe functional limitation[3]. This method reduces pain and improves function and quality of life. Other indications include rheumatoid arthritis, inflammatory polyarthropathies, femoral head avascular necrosis, traumatic arthritis, arthrosis[4]. Total knee arthroplasty can cause bleeding, wound complications, thromboembolism, medial collateral ligament injury, instability, periprosthetic joint infection, osteolysis, periprosthetic fracture, extensor mechanism disorder, implant loosening, implant fracture, dehiscence of the tibial insert, repetitive surgery, revision, and death[5]. It is significant to know the effects of COVID-19 on perioperative results. Although there are studies on this subject, the results are conflicting. It is thought that COVID-19 may cause systemic coagulation activation and extensive intravascular coagulation, leading to extreme inflammation, platelet activation, hypoxia, and thrombotic disease. The duration of this hyperinflammation and hypercoagulopathy following COVID-19 is unknown. It has been observed[6] that complication rates are high in patients who received early surgical treatment after having

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COVID-19 infection during the pandemic period, especially in major surgeries. While thromboembolic complications are more common in the first 4 weeks after COVID-19 infection, the risk of postoperative pneumonia is higher in surgeries performed 4-8 weeks later. The patients should actually undergo surgery in the best clinical and laboratory situation[7]. Evidence[1] regarding the frequency of venous thromboembolism (VTE) in patients who had COVID-19 six months before total knee replacement surgery is weak. In this article, we aimed to compare the risk of developing complications between patients who had COVID-19 six months before the operation and patients who did not.

Patients and Methods

The study is a retrospective one conducted across multiple centers. Patients over the age of 18 who underwent total knee replacement between August 2020 and June 2022 were included in the study. Van Yuzuncu Yil University's Ethical Research Board approved the study (Date: 03/03/2023, No.: 2023/02-06).

Demographic information such as age and sex, underlying diseases, postoperative complications (surgical site infection, wound problem, periprosthetic fracture, deep vein thrombosis, pulmonary thromboembolism, hematoma, pneumonia, urinary tract infection) and exitus were recorded. The hospital information system and patient files were used to collect data. Patients with a COVID-19 diagnosis six months before TKA (Group 1) were matched with patients without a COVID-19 diagnosis (Group 2).

The diagnosis of COVID-19 was made with SARS-CoV-2 PCR positivity and/or COVID-19 involvement findings on thorax computed tomography. Complication rates after primary TKA were compared between cohorts. Complications were described as pneumonia, myocardial infarction (MI), pulmonary embolism (PE), deep vein thrombosis (DVT), hematoma periprosthetic joint infection, wound problems, periprosthetic fracture, urinary tract infection, and exitus.

Statistical Analysis

For each variable, power was calculated by taking at least 80% and type 1 error of 5%. To determine whether the continuous measurements in the study were normally distributed, Kolmogorov-Smirnov (n>50) and Skewness-Kurtosis tests were applied. Due to the normal distribution of the measurements, parametric tests were applied. Here are the descriptive statistics for the variables in our study, expressed as means, standard deviations, numbers, and percentages. To compare continuous measurements between groups, an independent *t*-test was used. In order to examine the relationship between categorical variables and groups, the Chi-square test was used. In the calculations, the statistical significance level (α) was taken as 5%, and the SPSS 26 (IBM Corp., Armonk, NY, USA) statistical package program was used.

Results

A total of 265 patients who underwent TKA surgery were included in the study. The two hundred seventeen (81.9%) of the patients were women. Forty-one (15.5%) of these patients had COVID-19 six months before surgery (Group 1). Two hundred and twenty-four patients had never had COVID-19 before (Group 2). The mean age of those who had COVID-19 was 68.51±7.1 years, and those who did not have it were 65.76±8.76 years, and there was no statistically significant difference between them (p=0.852). When the underlying diseases were examined, there was a statistically important difference between group 1 and group 2 in favor of group 2 in terms of asthma (p=0.002) (Table I). In terms of complications, group 1 and group 2 did not differ (Table II).

Discussion

In this study, we evaluated whether there is an increased risk of complications after TKA in patients who had COVID-19 six months ago. We have seen that there are studies in the literature done in different time periods before. However, our study has the longest time span among these publications. We know that there is a risk of thromboembolism after TKA. Coagulopathy also occurs in COVID-19. In the case series reported to date, the incidence of VTE appears to be high in COVID-19. In a study[8] of 184 patients with severe COVID-19, the incidence of VTE was reported as 27%, all of whom received prophylaxis. Pulmonary embolism was found in 80% of cases with VTE. In a prospective study[9] conducted in France, PE was found in 25 of 150 severe COVID-19 patients and DVT in 3 (19%). Factors that increase the incidence of thromboembolism are advanced age, estrogen use, nephrotic syndrome, malignancy, previous

Table I. Comparison of groups with underlying diseases.

	Group 1 (41) N (%)	Group 2 (224) N (%)	*p*-value
Asthma	14 (34.1)	32 (14.3)	0.002
Cancer	-	3 (1.3)	
Anemia	2 (4.9)	35 (15.6)	0.068
CVD	-	-	
CHF	4 (9.8)	7 (3.1)	
CAD	6 (14.6)	40 (17.9)	0.05
Diabetes Mellitus	11 (26.8)	56 (25)	0.616
Coagulopathy	-	1 (0.4)	0.804
Hypertension	18 (43.9)	116 (51.8)	
Chronic liver disease	-	1 (0.4)	0.353
Obesity	10 (24.4)	37 (16.5)	
Peripheral Vascular Disease	1 (2.4)	4 (1.8)	0.225
Peptic Ulcer	-	-	0.767
Chronic renal failure	-	4 (1.8)	
Rheumatoid arthritis	-	6 (2.7)	
A history of deep vein thrombosis	-	3 (1.3)	
Goiter disease	5 (12.2)	31 (13.8)	0.778

CVD: Cerebrovascular disease, CHF: Congestive heart failure, CAD: coronary artery disease.

Table II. Comparison of complications and groups.

	Group 1 (41) N (%)	Group 2 (224) N (%)	*p*-value
Prosthetic Infection	3 (7.3)	20 (8.9)	0.736
Wound Problems	2 (4.9)	17 (7.6)	0.536
Myocardial infarction	-	3 (1.3)	
Periprosthetic Fracture	-	-	
Deep vein thrombosis	1 (2.4)	1 (0.4)	0.757
Pulmonary Embolism	1 (2.4)	4 (1.8)	0.713
Hematoma	-	8 (3.6)	
Pneumonia	-	-	
Urinary tract infection	-	-	
Exitus	-	1 (1.8)	

thromboembolism, congestive heart failure, presence of femoral vascular catheter, hypertension, diabetes mellitus, inflammatory bowel diseases, hyperlipidemia, long-term immobilization and long operation time[10-12]. In the study by Forlenza et al[13], patients with COVID-19 infection in the early postoperative time had higher rates of VTE, acute renal failure, MI, pneumonia, and urinary tract infection associated with a diagnosis of COVID-19 following total joint arthroplasty (TJA). In COVID-19-positive patients, deep vein thrombosis and PE were more common than in matched controls. It has been reported that additional studies are needed to determine whether a more aggressive anticoagulation regimen is indicated in TJA patients diagnosed with COVID-19 in the early postoperative period. Johnson et al[14], noted an increased risk of MI, pneumonia, and VTE in patients diagnosed with COVID-19 within 90 days of TJA.

In the study by Rosas et al[15], they evaluated the 90-day results in patients who had TJA, with and without a history of COVID-19, despite previous studies showing that COVID-19 is a cause of systemic coagulation activation, excessive inflammation, platelet activation, hypoxia, and disseminated intravascular coagulation leading to thrombotic disease. The study showed an increased incidence of VTE in patients with prior COVID-19 infection. In addition, in this study[15], it was reported that there was no difference in the duration of stay, as well as infection, cardiac arrest, and other complications between those who had COVID-19 and those who did not. However, in the limitations of the study, it was stated that

this study had early and medium-term results and should be evaluated in data over 90 days.

Even after the resolution of COVID-19 infection in patients, persistent symptoms may add to the overall perioperative risk. In the study of Lee et al[16], it was reported that postponing surgery for at least three months after the diagnosis of COVID-19 helps to reduce the overall risk of postoperative complications. It has been suggested that for patients with pre-existing respiratory problems or high risks of DVT, it is best to postpone surgery for at least six months after diagnosis of COVID-19. As additional data on COVID-19 were reported in this study[16], it was stated that it would be appropriate to expand it to include patients diagnosed with COVID-19 six months before TJA to assess when the risk of DVT and pneumonia returns to normal.

Our study included long-term data (patients diagnosed with COVID-19 six months before TKA) and no significant difference was found in terms of infection, heart attack, DVT, pulmonary embolism, hematoma, pneumonia, urinary tract infection.

Study Limitations

The two groups examined are similar in demographic characteristics and in postoperative complications, but there is a big difference between them in the number of patients enrolled. Another limitation of our study is the retrospective design.

Conclusions

As a result, studies have been conducted to evaluate complications in patients who have had COVID-19 in the short and medium term and have undergone total joint arthroplasty, and different results have been obtained. Our study is important because it includes the long term complications. This study found that the rate of complications, including deep vein thrombosis, in patients who had COVID-19 six months before total knee arthroplasty was not higher than those who did not. However, studies with a larger number of patients may be needed.

Conflict of Interest

The authors have no conflict of interest to declare.

Ethics Approval

This study was approved by the Van Yuzuncu Yil University Clinical Research Ethics Committee (Date: 03/03/2023, No.: 2023/02-06).

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Availability of Data and Materials

The data of the study is available upon request from the corresponding author.

Authors' Contributions

All authors made contributions to the drafting of the study. SK and AD designed the details of the study. SK provided the data. The analysis was carried out by SK and AD, and SK interpreted the analysis and wrote the paper. SK and AD shaped the final version, and all authors approved the final version of the article.

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