

Incidence of post-surgical complications in patients undergoing total knee arthroplasty: a prospective study with 122 patients

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Abstract

Total knee arthroplasty (TKA) represents an effective therapeutic option for the treatment of advanced cases of knee osteoarthritis. Although considered safe, monitoring in the intensive care unit (ICU) reduces the chance of early fatal complications, and for this reason, many specialized treatment centers refer their patients to the ICU in the immediate postoperative period. We prospectively evaluated 122 patients monitored in the ICU for 24 hours after TKA to assess the profile of patients who had complications and to determine incidence of post-surgical complications. The most common complications were hypotension (6 cases; 28.57%), delirium (3 cases; 14.29%), hypovolemia (2 cases; 9.52%), hypoxemia (2 cases; 9.52%) and anemia (2 cases; 9.52%). The factor that showed a statistically significant positive correlation with complications was age over 70 years ($p=0.015$). We concluded that there was an association between the patient's age and the presence of post-surgical complication, and it was identified that the most common postoperative complication in the first 24 hours in the ICU was hypotension. Factors such as sex, diabetes, SAH, obesity and smoking are still conflicting and need more investigation.

Keywords: Total knee arthroplasty; Postoperative complications; Intensive care.

Introduction

Total knee arthroplasty (TKA) represents an effective therapeutic option for the treatment of advanced cases of knee osteoarthritis, providing

pain relief, improvement in joint function and, consequently, positive effects on quality of life [1, 2].

Studies show good or excellent clinical results in more than 90% of patients undergoing TKA, with

postoperative satisfaction rates between 80 and 90% and surgical survival rates above 90% in 10 years [1-3].

Despite being considered safe, TKA is not without complications. Among the most important, we can highlight blood loss with various hemodynamic disorders, pulmonary embolism, massive hematoma and changes in mental status [4, 5].

A recent systematic review reported mortality rates at 30 and 90 days after total knee arthroplasty of 0.10% (95%CI= 0.07% to 0.14%) and 0.19% (95%CI= 0.15% to 0.23%), respectively. The main cause of death was cardiovascular disease [6].

Considerable risk factors for an increased mortality rate include previous low hemoglobin, advanced age, cardiorespiratory diseases and bilateral procedures [7].

Monitoring in the intensive care unit (ICU) reduces the chance of early fatal complications in this procedure; therefore, the postoperative period within the first 24 hours is routinely carried out in ICUs in several centers specialized in TKA [7]. To plan flows, improve hospitalization dynamics and reduce costs, we observed the need to identify which patients truly need monitoring in the ICU after TKA surgery.

The aim of this study was to assess the incidence of complications in the immediate postoperative period of TKA and what were the most common comorbidities in patients who had post-surgical complications.

Methods

All patients undergoing TKA surgery from September to December 2013 at our hospital were retrospectively evaluated. We declare that the patient approved the study by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

All patients were monitored in the first 24 hours after surgery in the ICU. We sought to identify, through medical records review, the need for intravenous hydration and additional analgesia, blood transfusion, use of vasoactive amines, use of antiarrhythmic drugs, sedatives or any other atypical procedure performed during the period.

Regarding risk factors, we assessed age, sex, classification of the American Society of Anesthesiologists (ASA), body mass index (BMI), systemic arterial hypertension (SAH), diabetes mellitus (DM), smoking and any other comorbidity present in an attempt to identify which of these were related with postoperative complications.

We evaluated the correlations of the results using Student's t test ($p < 0.05$ statistically significant) and used percentages for qualitative variables. Statistical analysis was performed using SAS® System statistical software, version 6.11 (SAS Institute, Inc., Cary, North Carolina).

Case Report

A total of 122 patients undergoing TKA (84 women and 38 men) were

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evaluated. The mean age was 69 ± 7.2 years (47 - 87), and the mean BMI was 31.4 ± 5.1 kg/m² (19.9 - 46.9). Of these, 15 had complications in the immediate postoperative period of TKA while they remained hospitalized in the ICU.

The most common complications were hypotension (6 cases; 28.57%),

delirium (3 cases; 14.29%), hypovolemia (2 cases; 9.52%), hypoxemia (2 cases; 9.52%) and anemia (2 cases; 9.52%).

A total of 21 complications were observed in these 15 patients. Table 1 shows these complications, with their respective percentages.

Table 1. List of complications that occurred during 24 hours of postoperative monitoring.

Complications	Absolut number	Percentual number
Hypotension (AP<80x50)	6	28,57%
Delirium	3	14,29%
Hypoxemia (O ₂ sat < 88)	2	9,52%
Hypovolemia	2	9,52%
Anemia (Hb< 8 mg/dl)	2	9,52%
Deep vein thrombosis	1	4,76%
Cardiac arrhythmia	1	4,76%
Hypertension (AP>170x110)	1	4,76%
Fever (AxT > 38,2)	1	4,76%
Bradycardia (HR<60 bpm)	1	4,76%
Massive hematoma in the surgical wound	1	4,76%
Total	21	100,00%

Legend: AP. Arterial pressure sat. Saturation Hb. Hemoglobin Axt. Axilar temperature HR. Heart rate

The 15 patients who had complications in the ICU were stratified according to several known risk factors for complications after TKA, as shown in

table 2. The factor that showed a statistically significant positive correlation with complications was age over 70 years ($p = 0.015$).

Table 2. Distribution of patients who presented complications in the intensive care unit according to known risk factors.

Risk factors for complications	Total number of operated patients	Absolute number of complications	Absolute percentage of complications	Relative percentage of complications	p value
Age < 70 yo	68	4	26,67	5,8	0,015
Age \geq 70 yo	54	11	73,33	20,3	
Smoking	13	1	6,67	7,6	0,5
No smoking	109	14	93,33	12,8	
Male	38	4	26,67	10,5	0,47
Female	84	11	73,33	13,0	
ASA I	12	1	6,67	8,3	$I \times II = 0,5$

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ASA II	107	13	86,67	12,1	III x I e II = 0,47
ASA III	3	1	6,67	33,3	
BMI < 30 kg/m ²	12	1	6,67	8,3	0,93
Bmi ≥ 30 kg/m ²	110	14	93,33	12,7	
SAH	100	14	93,33	14,0	0,46
No SAH	22	1	6,67	4,5	
DM	33	6	40,00	18,1	0,36
No DM	89	9	60,00	10,1	
AMI	2	0	0,00	0,00	0,77
No AMI	100	0	0,00	0,00	
CHF	1	0	0,00	0,00	0,88
No CHF	121	0	0,00	0,00	
Pulmonary pathologies	6	1	6,67	16,6	0,55
No pulmonary pathologies	116	0	0,00	0,00	
Previous cancer	3	1	6,67	33,3	0,33
No previous cancer	119	0	0,00	0,00	
Rheumatism	11	1	6,67	9,09	0,60
No rheumatism	111	0	0,00	0,00	

Legend: ASA. American Society of Anesthesiologists. BMI. body mass index. SAH. systemic arterial hypertension. DM. diabetes mellitus. AMI. acute myocardial infarction. CHF. congestive heart failure. p value calculated by student t-test. p<0.05 statistically significant.

Discussion

TKA is a safe procedure but is not free from clinical complications, and the literature is rich in studies that address such complications but poor in studies that demonstrate the relationship of these complications with the period of intensive care in the immediate post-operative period [5, 6].

Cardiovascular and respiratory events are the most common complications reported in the literature in the early postoperative period of TKA [8]. We found that hypotension, delirium, hypoxemia and hypovolemia were the most frequent complications during the first 24 hours after surgery.

Regarding risk factors or predictors of post-TKA complications, age is known to be an important factor. Mantilla et al. [9], evaluating 10.244 patients undergoing primary knee and hip arthroplasties, reported 224 patients (2.18%) with clinical complications, with 0.4% myocardial infarction, 0.7% pulmonary embolism, 1.5% deep vein thrombosis and a death rate of 0.5%. These authors found that there is an increase in the incidence of these clinical complications with increasing age, especially in patients aged over 70 years. We found a higher percentage of complications in patients older than 70 years (20.3 vs 5.8%; p=0.015), corroborating the literature data.

Regarding the effect of smoking as a risk factor for complications after arthroplasty, Duchman et al [10] studied 78,191 patients undergoing primary total hip or knee arthroplasty. Of these, 81.8% (63,971) were nonsmokers, 7.9% (6158) were former smokers, and 10.3% (8062) were current smokers. Current smokers had a higher rate of wound complications (1.8%) than former smokers and nonsmokers (1.3% and 1.1%, respectively; $p<0.001$).

Former smokers had a higher rate of total complications (6.9%) than smokers and nonsmokers (5.9% and 5.4%, respectively; $p<0.001$). Our study, however, showed a higher incidence of complications among nonsmokers, although without statistical significance (12.8 vs 7.6%; $p=0.5$). However, as a limitation, our study only analyzed the association with current smoking and did not consider patients who were smokers. In addition, the sample of smokers was relatively small ($n=13$), which reduces the accuracy of the study.

Despite the slight predominance of complications in females in our assessment, there was no statistically significant difference between the groups (male 10.5% and female 13%; $p=0.47$). This result contrasted with what was observed in the literature. Mantilla et al. [9], evaluating 10,244 patients undergoing knee and hip arthroplasty, found a higher incidence of perioperative clinical complications in males, especially in relation to acute myocardial infarction.

Patients with higher ASA scores combined with peripheral vascular disease with or without bleeding disor-

ders are at especially high risk of developing adverse postsurgical events [11]. In our study, when analyzed according to the ASA classification, although in percentage terms there were more complications in score III, there was no statistically significant difference between them (I - 8.33%; II - 12.14%, III - 33.3%, $p=0.47$).

Rauh et al. [12] evaluated 3438 knee and hip arthroplasties, which showed that patients with ASA III had an incidence of death after the surgical procedure of 0.92%, statistically higher than the 0.07% found in ASA II patients. Based on these data, they concluded that a higher ASA score was associated with a greater risk of perioperative death.

We observed a higher incidence of complications among the obese patients than among the nonobese patients, but the difference was not statistically significant (12.7 vs 8.3%; $p=0.93$). Suleiman et al. [13] retrospectively evaluated 1,731 arthroplasties, 66% on the knee and 34% on the hip. Patients were categorized according to the World Health Organization classification of obesity. These authors did not identify significant differences in perioperative complications between different degrees of obesity. D'Apuzzo et al. [14] reported a higher rate of complications in morbidly obese patients, with a higher risk of postoperative intrahospital infection, wound dehiscence, and genitourinary complications. There was no increase in the prevalence of cardiovascular or thromboembolic complications. Morbidly obese patients also had a higher risk of in-hospital death

after primary TKA than nonobese patients.

We observed an apparent higher incidence of complications in hypertensive patients, but without statistical significance (14 vs 4.5%; $p=0.46$). Other studies have reported a positive correlation between SAH and complications, mainly related to cardiovascular events [15].

We also observed an apparent higher incidence of complications among diabetic patients than among non-diabetic patients, but the difference was not statistically significant (18.1 vs 10.1%; $p=0.36$). Marchant et al. [16] retrospectively evaluated approximately one million patients regarding the relevance of DM as a risk factor after arthroplasties. For this sampling, they stratified patients into three groups: uncontrolled DM ($n=3973$), controlled DM ($n=105,485$) and patients without DM ($n=920,555$).

They concluded that DM is a strong risk predictor for complications after arthroplasties, with uncontrolled diabetes being the highest risk group. In our series, the values found show a similar trend, but probably due to the limited number of patients evaluated, we did not observe a statistically significant difference. A larger sample will be needed to improve accuracy and confirm the results found in our evaluation.

Discussion

We concluded that here was an association between the patient's age and the presence of post-surgical complication, and it was identified that the

most common postoperative complication in the first 24 hours in the ICU was hypotension. Factors such as sex, diabetes, SAH, obesity and smoking are still conflicting and need more investigation.

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