

Venous thromboembolism incidence in unilateral versus bilateral total knee joint replacement

Abstract

Background: The commonest joint replacement performed around the world as well as in Prince Sultan Military Medical City (PSMMC) in Riyadh, Saudi Arabia, is total knee joint replacement (TKR). Bilateral TKR requires single anesthesia, short hospital stay, single rehabilitation, and is cost-effective. However, some post-TKR risks have been reported.

Objective: To determine the incidence of venous thromboembolism (VTE) associated with bilateral TKR.

Methods: This was a retrospective study conducted at the Department of Orthopedic Surgery in PSMMC. Data on arthroplasties performed during June 2012 until June 2014 were retrieved. A total of 181 patients who had undergone TKR (unilateral = 94; bilateral = 87) for knee arthritis were included in the study. The patients had undergone primary total knee arthroplasty (TKA) using a mechanical compressive device and had received pharmaceutical prophylaxis. Color Doppler ultrasonography was performed for the bilateral common femoral veins, superficial veins, popliteal veins, and calf veins by a skilled radiologist for all symptomatic (VTE symptoms) patients. Lower-extremity venography dynamic computed tomography was performed for patients suspected of deep vein thrombosis (DVT) or pulmonary embolism (PE).

Results: A total of 181 patients had TKR. Of these patients, 84 (46.41%) were male and 97 (53.59%) were female. VTE was diagnosed in 4 patients (2.21%) only. A preoperative anticoagulant was given to 58 patients (32.04%) only. The mean age of the 4 patients diagnosed with VTE was 73.5 ± 7.93 years. Among these patients, 2 (50%) were male and 2 (50%) were female. Only 1 patient (25%) underwent unilateral TKR and the remaining 3 patients (75%) underwent bilateral TKR. Regarding type of VTE, 2 patients (50%) had PE, 1 patient (25%) had massive PE, and 1 patient (25%) had DVT.

Conclusion: Our study demonstrates a low frequency of VTE after TKR in patients with and without chemoprophylaxis. Even so, orthopedic surgeons should carefully consider the risk factors of VTE before performing major orthopedic surgeries and should remain aware of the possibility of the development of DVT after surgery in high-risk patients.

Keywords: arthroplasty, knee, thromboembolism, prophylaxis

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Introduction

The most common complication after total hip replacement and total knee replacement (TKR) surgery is venous thromboembolism (VTE), comprising pulmonary embolism (PE) and deep vein thrombosis (DVT).^{1,2}

One of the most successful orthopedic surgeries is total knee arthroplasty (TKA), which improves patients' quality of life.^{3,4} Without DVT prophylaxis, this procedure is associated with high DVT and PE risk of up to 85%, which necessitates VTE prophylaxis.⁵

Patients who develop VTE are faced with about 10times higher healthcare costs and hospital stays of more than twice the length of patients who do not develop VTE. The mortality rate after PE is 19.49%.⁶

Total joint arthroplasties are increasingly performed worldwide; therefore increased incidence of VTE is expected. Although the occurrence of symptomatic DVT and PE is low, asymptomatic DVT is present in 20%–40% of patients who undergo total hip arthroplasty (THA) and TKA.⁷ The occurrence of VTE is very high in patients who do not receive DVT prophylaxis, especially after lower extremity arthroplasties. The occurrence of asymptomatic DVT, which is confirmed with imaging studies, varies from 42% to 57% after THA and from 41% to 85% post-TKA.^{8–10}

Although many studies have been carried out and there is much past experience, there remains no proper method of thromboprophylaxis for patients who undergo THA and TKA; therefore, it is worrisome that many patients are in danger due to inappropriate prophylaxis or increased risk of bleeding.

The natural history, causes, and related risk factors of VTE are well understood and can be used to identify patients who are at increased risk of VTE perioperatively, along with methods for quantifying the risk and approaches for preventing thrombotic attacks.^{11,12}

The long-term consequences of VTE, such as post-thrombotic syndrome, recurrent VTE, and chronic pulmonary hypertension, are a considerable healthcare concern.^{12,13}

In this study, the main focus was assessing the incidence of VTE associated with bilateral TKR as compared with unilateral TKR.

Objective

The purpose of this study was to determine the incidence of VTE associated with bilateral TKR in comparison with unilateral TKR.

Material & methods

This was a retrospective study conducted at the Department of Orthopedic Surgery in Prince Sultan Military Medical City (PSMMC), Saudi Arabia. Data on arthroplasties performed during June 2012 until June 2014 was retrieved. A total of 181 knee joint replacements (unilateral = 94; bilateral = 87) with knee arthritis were included in the study. Patients had undergone primary TKA using a mechanical compressive device and some had received pharmaceutical prophylaxis.

Data collection

The criterion for diagnosing VTE (investigations done: color Doppler ultrasonography and computed tomography [CT] venography for symptomatic patients only) was a filling defect in a deep vein or defects surrounded by a narrow rim of contrast material. Patients with thrombi did not receive anticoagulation therapy, and they underwent further bilateral simultaneous or unilateral venogram at 6 weeks after surgery to document the natural history of VTE.

Surgical procedure

The surgeries were performed by the same surgeon (SJY) using a medial parapatellar approach. Cemented TKA (Johnson & Johnson) or GENESIS II (Smith & Nephew) was used with a tourniquet inflated to 300 mmHg. After a skin incision, a capsular incision was performed to expose the medial and lateral femoral condyles, with subsequent tibial plateau and soft tissue release. A measured resection technique was used for the proximal tibial and distal femoral bone cuts. The tibial cut was made perpendicular to the mechanical axis using an extramedullary alignment guide, with the posterior tibial slope set at 3°. After thoroughly removing posterior femoral osteophytes, a trial implant was inserted to assess the joint space, varus/valgus stability, and patellar tracking. Cement was used for tibial and femoral fixation. Tibial osteophyte removal was performed. If synovial thickening was observed, synovectomy was performed as well. Straight-leg raising exercises were initiated from the day of surgery, and continuous passive motion was started. Weight-bearing ambulation was allowed from the first postoperative week onwards.

Assessment of thromboembolic events

Color Doppler ultrasonography was performed for the bilateral common femoral veins, superficial veins, popliteal veins, and calf

veins by a skilled radiologist for all symptomatic (VTE symptoms) patients. Lower extremity venography dynamic CT was performed for patients suspected of DVT or PE. Symptoms of DVT and PE, including chest pain, dyspnea, and painful swelling on lower extremities, and positive findings on color Doppler ultrasonography, were considered grounds for exclusion. If hemoglobin was <8 g/dL or if the patient exhibited hemodynamic instability, transfusion was performed.

Data analysis

Data entry and analysis was performed using SPSS 20. Quantitative variables are presented as the mean±SD. Qualitative variables are presented as frequencies and percentages.

Results

In this study, a total of 181 patients underwent TKR. Of these patients, 84 (46.41%) were male and 97 (53.59%) were female. Diabetes and hypertension was present in 101 patients (55.80%) and 143 patients (79.01%), respectively. Bronchial asthma and PE were present in 16 patients (8.84%) and 2 patients (1.10%), respectively. VTE was diagnosed in 4 patients (2.21%) only. Preoperative anticoagulant was given to 58 patients (32.04%) only. General anesthesia was given to 54 patients (29.83%) and spinal/epidural anesthesia was given to 127 patients (70.17%). The mean age of patients diagnosed with VTE was 73.5±7.93 years. Of these patients, 2 (50%) were male and 2 (50%) were female. Only 1 patient (25%) of the four with VTE was diabetic and hypertensive. One patient (25%) with VTE had undergone unilateral TKR and the remaining 3 patients (75%) had undergone bilateral TKR. Regarding type of VTE, 2 patients (50%) had PE, 1 patient (25%) with massive PE, and 1 patient (25%) had DVT (Table 1) (Table 2).

Table 1 Patients characteristics for Unilateral & Bilateral Total Knee replacement

	Total Knee Replacement		Total	
	Unilateral	Bilateral		
Number of patient	94	87	181	
Gender	Male	54	30	84
	Female	40	57	97
Diabetes	Yes	48	53	101
	No	46	34	80
Hypertensive	Yes	67	76	143
	No	27	11	38
BA	Yes	8	8	16
	No	86	79	165
PE(Pulmonary Embolism)	Yes	2	0	2
	No	92	87	179
DVT	Yes	1	3	4
	No	93	84	177
Pre-Op Anticoagulant	Yes	33	25	58
	No	61	62	123
General Anesthesia	29	25	54	
Spinal/ Epidural Anesthesia	65	62	127	

Table 2 Incidence of VTE and related factors of patients

Incidence of VTE		4/181 (2.20%)
Age (Years)		73.5±7.93
VTE after how many days		6.00±3.91 Days, Range: [2-11]
Unilateral-TKR		1(25%)
Bilateral-TKR		3(75%)
Gender	Male	2(50%)
	Female	2(50%)
Diabetes	Yes	1(25%)
	No	3(75%)
Hypertensive	Yes	1(25%)
	No	3(75%)
Type of VTE	PE	2(50%)
	PE Massive	1(25%)
	DVT	1(25%)
Pre-Op Anticoagulation given	Yes	2(50%)
	No	2(50%)
Type of Anesthesia	General	2(50%)
	Spinal	1(25%)
	Epidural	1(25%)
Blood Transfusion	Yes	2(50%)
	No	2(50%)

Discussion

In this study, the frequency of VTE after TKR in patients with and without thromboprophylaxis was very low, i.e., 2 of 58 patients who had received preoperative thromboprophylaxis had VTE (3.45%), and 2 of 123 patients who had not received thromboprophylaxis had VTE (1.63%). Patients who had undergone bilateral TKR had increased incidence of VTE (3.75%) as compared to patients who had undergone unilateral TKR (1.25%).

However, thrombotic events incidence can vary greatly, ranging from 0% to 64% for total hip replacement and 11% to 77% for TKE.¹⁴⁻¹⁶

Different Asian studies have reported differing incidences of DVT (Korea, 7.5%; Southeast Asia, 11.8%; Japan, 11.0%).¹⁷ In a study by Kim et al.¹⁸ VTE occurred in 94 of 1434 knees (6.6%) that had mechanical compression after TKA. Lee et al.⁸ reported the occurrence of VTE, DVT, and PE during 3 months as 3.8% (n = 1990), 3.2% (n = 1,699), and 0.7% (n = 355) after TKR. In a prospective study by Kim et al.¹⁹ the occurrence of DVT was 41.8% following bilateral TKR and 41.4% following unilateral TKR.

The occurrence rate of PE after TKR in patients who do not

receive thromboprophylaxis is very low. In 2 studies, in which the objective endpoint included the diagnosis of PE on perfusion lung scan, 22% of 186 patients and 33% of 12 patients had symptoms of PE.^{21,22} The incidence of symptomatic PE after TKR in patients who do not receive prophylaxis is very low and ranges from 1% to 2%, and that of fatal PE is <1%.^{22,23}

Our study confirms that old age is a risk factor for VTE.²⁴⁻²⁶ In our study, mean age of patients with VTE was 73.5±7.93 years. Moreover, older patients need major surgeries and are also immobilized due to other comorbid conditions. In the present study, no significant difference was seen for DVT between male and female patients. Lee et al.²⁶ found that women were at more risk of developing DVT. However, other previous studies have found no difference in the occurrence of DVT according to sex.^{27,28}

It has been believed that the incidence of DVT after THA and TKA is lower in Asian populations as compared to Western populations.²⁹⁻³¹ However, recent multi-centric prospective studies conducted in Asia have shown the occurrence of VTE after major orthopedic surgeries, including THA and TKA, in comparison with Western populations.³²⁻³⁶ Incidences of clinically relevant symptomatic VTE after hip and knee arthroplasty have also been reported in East Asian populations.^{30,31}

In a systematic review and meta-analysis, Kanchanabat et al.⁵ examined the incidence of VTE after orthopedic surgery in Asian patients without thromboprophylaxis and found very low incidence of proximal and symptomatic DVT as compared to Western populations, and no patient died of DVT.³⁵ Interracial differences, genetic factors, and a Western lifestyle may affect the occurrence of DVT.¹⁷

Orthopedic surgeries are one of the major risk factors for the development of DVT. Thromboplastin released from dissected soft tissues and reamed bones, and venous stasis after surgery and postoperative immobilization cause increased incidence of DVT.³⁶

Conclusion

Our study demonstrates a low frequency of VTE after TKR in patients with and without preoperative chemoprophylaxis. Even so, orthopedic surgeons should carefully consider the risk factors of VTE before performing major orthopedic surgeries and should remain aware of the possibility of the development of VTE after surgery in high-risk patients.

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None.

Conflict of interest

Authors declare there is no conflict of interest in publishing the article.

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