

Safety of Tourniquet Use in Total Knee Arthroplasty in Patients With Radiographic Evidence of Vascular Calcifications

Steven M. Koehler, MD, Adam Fields, BA, Naudereh Noori, BS, Mitchell Weiser, MD, Calin S. Moucha, MD, and Michael J. Bronson, MD

Abstract

Tourniquets are often used in total knee arthroplasty (TKA) to improve visualization of structures, shorten operative time, reduce intraoperative bleeding, and improve cementing technique. Despite these advantages, controversy remains regarding the safety of tourniquet use. Tourniquets have been associated with nerve palsies, vascular injury, and muscle damage. Some have hypothesized they may also cause deep vein thrombosis. Last, increased incidence of postoperative wound complications has been reported with use of tourniquets.

We conducted a retrospective cohort study to determine whether tourniquet use in TKA in patients with preexisting radiographic evidence of vascular disease increases the risk for wound complications or venous thromboembolism (VTE). Patients (N = 373) were placed in 2 groups: One had no preoperative radiographic evidence of knee arterial calcification (n = 285), and the other had arterial calcifications (n = 88). Overall, arterial calcification did not increase the risk for wound complication or VTE ($P > .05$). Furthermore, location of arterial calcification did not affect risk for wound complication or VTE. There were no arterial injuries. Diabetes, hypertension, prior VTE, coronary artery disease, and male sex were linked to higher wound complication rates ($P < .05$).

Patients who have preoperative radiographic evidence of arterial calcification can safely undergo tourniquet-assisted TKA.

Tourniquets are often used in total knee arthroplasty (TKA) to improve visualization of structures, shorten operative time, reduce intraoperative bleeding, and improve cementing technique. Despite these advantages, controversy remains regarding the safety of tourniquet use. Tourniquets have been associated with nerve palsies, vascular

injury, and muscle damage.¹⁻⁵ Some have hypothesized they may cause venous stasis or direct endothelial damage that may develop into deep vein thrombosis (DVT). Abdel-Salam and Eyres⁶ found an increased incidence of postoperative wound complications and DVTs associated with tourniquet use.

Moreover, investigators have analyzed the role of tourniquets in populations at high risk for wound complications. DeLaurentis and colleagues⁷ performed a prospective and retrospective analysis of 1182 TKA patients, 24 (2%) of whom had preexisting peripheral vascular disease (PVD), defined as a history of arterial insufficiency, absent dorsalis pedis and/or absent posterior tibial pulsations, and arterial calcifications. A tourniquet was used in each case. Arterial complications occurred in 6 of the 24 patients with PVD. As expected, the authors found that a history of intermittent claudication, pain at rest, and arterial ulcers resulted in a high risk for vascular complications. Further studies have supported this finding and expanded the list of predisposing factors to include previous vascular surgery and absent and asymmetric pedal pulsations.⁷⁻¹¹ Of particular concern to total joint arthroplasty surgeons was the finding by DeLaurentis and colleagues⁷ that patients with radiographic evidence of calcification of the distal superficial femoral artery and/or popliteal artery were at risk for arterial complications. This finding is also supported by other studies.^{8,11} In TKA, damage to arterial structures proximal to the surgical field could manifest as impaired postoperative wound healing or an ischemic limb. Wound healing depends on adequate blood flow to the healing tissue, and any damage to arterial or venous structures can theoretically compromise this process.

Added to vascular/wound complications as concerning complications in orthopedic surgery is venous thromboembolism (VTE). The role of tourniquets in the formation of VTEs is controversial. A tourniquet has the potential to increase the risk for DVT because of the stasis of venous blood in the lower limb or possible damage to calcified blood vessels. Callam and colleagues¹² studied the connection between artery disease and chronic leg ulcers and found that half the patients diagnosed with peripheral artery disease also had stigmata of chronic venous insufficiency. Therefore, the entities can occur

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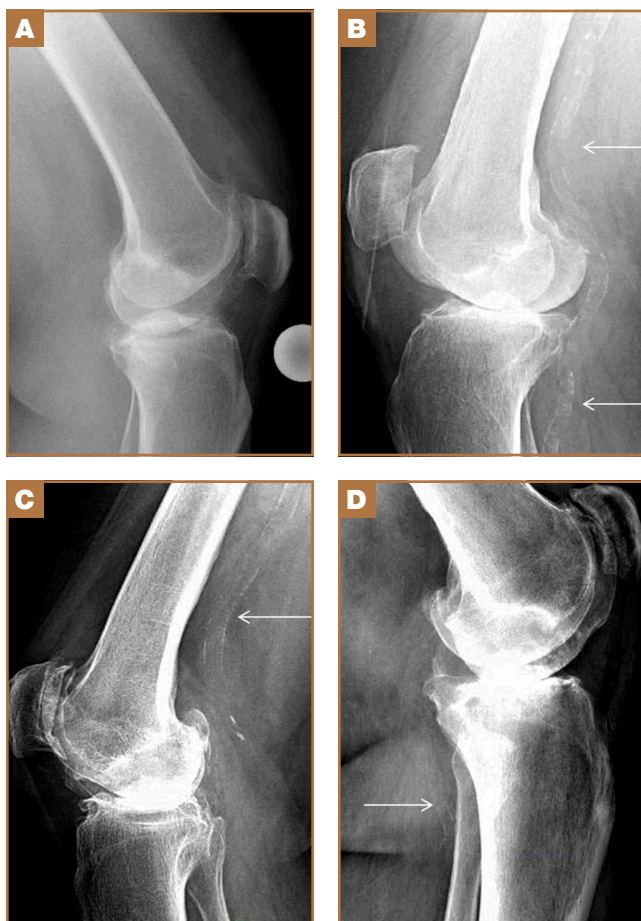


Figure. Preoperative radiographs show (A) no calcification of knee, (B) calcification of proximal popliteal artery and distal popliteal artery, (C) calcification of only proximal popliteal artery, and (D) calcification of only distal popliteal artery.

in tandem, and surgeons should keep this in mind.

Here we report on a study we conducted to determine whether tourniquet use in TKA in patients with preexisting radiographic evidence of vascular disease increases the risk for wound complications or VTE.

Patients and Methods

We retrospectively reviewed 461 consecutive primary TKAs (373 patients) performed between January 2007 and June 2012 by 2 attending orthopedic surgeons specializing in adult reconstruction. Medical records and operative reports of 583 patients were examined after receiving institutional review board approval. Of these patients, 373 (64%) had a minimum of 12-month follow-up data available. Twelve months was deemed long enough to discover wound complications or DVTs secondary to the index procedure. Most of these outcomes manifest within the first 3 months after surgery and certainly by 12 months. Follow-up longer than 12 months may become a confounder, as wound complications outside the acute to subacute postoperative window could be related to patients' underlying PVD and not directly to tourniquet use during sur-

gery. Patient demographics and comorbidities were recorded. Comorbidities were obtained from preoperative medical evaluations and surgeons' preoperative evaluations. All patients had preoperative palpable dorsalis pedis and posterior tibialis arterial pulses. No patient required preoperative vascular studies based on preoperative examination or comorbidities. No patient had prior vascular bypass surgery or stenting.

TKA was performed in a nonlaminar flow, positive-pressure, high-efficiency particulate air-filtered room with sterile toga/surgical helmet systems. For all patients, a pneumatic thigh tourniquet was applied, and the patient was prepared and draped. After limb exsanguination using a rubber bandage, the limb was elevated and the tourniquet inflated to a pressure of 250 to 300 mm Hg. The tourniquet was released either just before closure or immediately after closure in all cases; it was always let down before placement of final bandages.

Prophylactic chemical anticoagulation consisting of warfarin, aspirin, or enoxaparin was used in all patients and continued for 4 to 6 weeks after surgery. All patients received mechanical DVT prophylaxis with sequential compression devices, and all were mobilized out of bed beginning either the day of surgery or the next day. All patients received perioperative intravenous antibiotics, with the preoperative dose given before tourniquet inflation and the last postoperative dose stopped within 24 hours of surgery.

All patients who had primary TKA underwent preoperative medical evaluation and optimization. The patient's hospital course was monitored closely, and complications noted by the orthopedic team were documented. Follow-up documentation was retrospectively reviewed for evidence of wound complications or VTE. Wound complications were defined as cellulitis, delayed wound healing, wound dehiscence, and/or periprosthetic joint infection. In the case of VTE, physical examination findings were not sufficient for inclusion. Venous duplex ultrasonography demonstrating the clot was reviewed before inclusion.

Preoperative radiographs were examined for arterial calcification (**Figure**). We refer to calcification seen above the knee joint as *proximal calcification* and to calcification observed below the joint as *distal calcification*. Patients exhibited calcification proximally only, distally only, or both proximally and distally. The 373 patients were placed into 2 groups based on whether they had preoperative arterial calcification on plain radiography of the knee. One group (285 patients with no radiographic evidence of preoperative knee arterial calcification) underwent 365 TKAs, and the other group (88 patients with radiographic evidence of preoperative knee arterial calcification) underwent 96 TKAs.

A sample size calculation was performed to determine how many patients were needed in each group with 80% power and an α of 0.05. With an estimated difference in VTE/wound complication rate between the calcification and no-calcification groups of 12%, we needed to review 316 TKAs total. This 12% difference was based on study findings of a 25% complication rate in PVD patients who underwent tourniquet-assisted TKA, and the rate of VTE/wound complication after TKA in patients overall, which can be up to 12%.^{7,13,14} We exceeded

minimal enrollment and had 461 TKAs. Descriptive statistics were reported, with means and ranges provided where appropriate. Independent t test was used to evaluate the differences in continuous data (age) between the groups. Univariate analysis (using Pearson χ^2 and Fisher exact tests) and multivariate logistic regression analysis were used to evaluate the effects of categorical variables (sex, comorbidity, calcification [presence, absence], and location of calcification [proximal only, distal only, both]) on wound complication and VTE rates. All tests were 2-tailed and performed with a type I error rate of 0.05. Data analysis was performed with SPSS Version 19.0 (SPSS).

Results

Patient characteristics are summarized in **Table 1**. Of the 373 patients, 285 lacked calcification, and 88 had calcification. Mean age was 67.73 years (range, 24-92 years) for all patients, 65.99 years (range, 24-89 years) for the no-calcification group, and 74.32 years (range, 54-92 years) for the calcification group; the calcification group demonstrated a trend toward older age, but the difference was not significantly different ($P = .07$). Of the 373 patients, 156 (41.82%) were male: 110 in the no-calcification group (38.60%) and 46 in the calcification group (52.27%); sex was significantly ($P = .002$) different between groups, with more males in the calcification group.

Data on total preoperative comorbidities are summarized in **Table 2**. Hypertension, hyperlipidemia, diabetes, and coronary

artery disease (CAD) were the most common comorbidities, and they were all significantly ($P \leq .05$) increased in the calcification group.

No patients had reported arterial complications, such as arterial bleeding, aneurysm, intimal tears, or loss of distal pulses. Wound complication after TKA was detected in 3.04% of all cases (**Table 3**). Rate of DVT after TKA was 2.60% of all cases, and rate of pulmonary embolism after TKA was 2.17% of all cases. Of the 96 TKAs with preoperative radiographic evidence of calcification, 47 (48.96%) had proximal calcification only, 11 (11.46%) had distal calcification only, and 38 (39.58%) had both proximal and distal calcification (**Table 4**). There was no significant difference between the rate of wound complication or VTE based on location of vascular calcification.

Univariate analysis demonstrated that presence of arterial knee calcification did not increase the risk for postoperative wound complication (odds ratio [OR], 1.04; 95% confidence interval [CI], 0.28-3.80; $P > .05$) (**Table 5**). Location of arterial knee calcification also did not increase the risk for postoperative wound complication. In addition, univariate analysis demonstrated that presence of arterial knee calcification did not increase the risk for postoperative VTE (OR, 1.20; 95% CI, 0.43-3.36; $P > .05$) (**Table 6**).

Of the 14 wound complications, the most common infections were cellulitis (5/14 cases; 35.71%) and infected hardware that required component revision (5/14 cases; 35.71%).

Table 1. Demographics

Demographic	Total	Group		P
		No Calcification	Calcification	
Procedures (patients), n	461 (373)	365 (285)	96 (88)	—
Mean (range) age, y	67.73 (24-92)	65.99 (24-89)	74.32 (54-92)	.07
Male, n (%)	156 (41.82)	110 (38.60)	46 (52.27)	.002

Table 2. Comorbidities

Comorbidity	Group						
	Total (N = 461)		No Calcification (n = 365)		Calcification (n = 96)		P
	n	%	n	%	n	%	
Hypertension	322	69.85	241	66.03	81	84.38	<.001
Hyperlipidemia	143	31.02	105	28.77	38	31.25	.05
Diabetes	86	18.66	56	15.34	30	31.25	.001
Coronary artery disease	73	15.84	45	12.33	28	29.17	<.001
Other cardiac disease	55	11.93	39	10.68	16	16.67	.26
Congestive heart failure	9	1.95	6	1.64	3	3.13	—
Arrhythmia	26	5.64	19	5.21	7	7.29	—
Valve disease	20	4.34	14	3.84	6	6.25	—
Prior venous thromboembolism	25	5.42	19	5.21	6	6.25	.62
Gout	16	3.47	13	3.56	3	3.13	>.99

Mean time from TKA to infection was 137.93 days (range, 5-783 days). The most common organism grown in culture from the wound was *Staphylococcus* (5/14 cases; 35.71%).

Additional univariate statistical analysis revealed that presence of diabetes, hypertension, prior VTE, CAD, and male sex was linked to higher incidence of wound complication ($P < .05$) (Table 5). When multivariate analysis was performed, hypertension, prior VTE, and male sex remained significant ($P < .05$) (Table 5).

Discussion

TKA is a safe and effective procedure used to treat osteoarthritis of the knee and improve patients' quality of life.¹⁵ About 700,000 TKAs are performed annually in the United States.¹⁶ Because of improvements in preventive medicine and medical technology, life expectancy is increasing, and TKAs are now being performed in higher numbers and in an older patient population. Over the next few decades, these developments will lead to more postoperative complications. It is projected that, by 2030, the need for TKAs in the United States will increase by 673% to 3.48 million.¹⁷ Postoperative complications

are rare but unfortunately often lead to poor outcomes or even mortality.¹⁸ To help minimize the number of postoperative complications, we must understand the safety of tourniquet use in TKA. Other investigators have concluded that tourniquet use is unsafe in patients with preoperative vascular calcifications on plain radiographs.^{7,8,11} The present study, designed to elucidate whether preoperative evidence of knee arterial calcification may predispose TKA patients to postoperative wound complication or VTE, had some important findings.

In our study, wound complication and VTE occurred in a considerable number of patients after TKA. Despite exceeding the number of patients calculated by the power analysis, our population may have been inadequate to fully detect statistical significance. Thus, our conclusion of failing to reject the null hypothesis may have been because of sample size, a type II error. We found that, after primary TKA, 3.04% of patients developed wound complications and 4.77% VTE. According to the literature, the incidence of infection after primary TKA is between 0.5% and 12%, and that of VTE reported within 3 months after TKA is 1.3% to 10%.^{13,14} Although we had 100% VTE prophylaxis, meeting the standard of care, VTE after

Table 3. Complications After Total Knee Arthroplasty

Complication	Group						P
	Total (N = 461)		No Calcification (n = 365)		Calcification (n = 96)		
	n	%	n	%	n	%	
Wound complications							
Cellulitis	5	1.08	4	1.10	1	1.04	—
Infected hardware	5	1.08	4	1.10	1	1.04	—
Dehiscence	2	0.43	2	0.55	0	0.00	—
Delayed wound healing	2	0.43	1	0.27	1	1.04	—
Total	14	3.04	11	3.01	3	3.13	>.99
Venous thromboembolism							
Pulmonary embolism	10	2.17	7	1.92	3	3.13	—
Deep vein thrombosis	12	2.60	10	2.74	2	2.08	—
Total	22	4.77	17	4.66	5	5.21	.79

Table 4. Complications After Total Knee Arthroplasty by Location of Calcification (n = 96)

Complication	Location of Calcification						P
	Proximal (n = 47; 48.96%)		Distal (n = 11; 11.46%)		Both (n = 38; 39.58%)		
	n	%	n	%	n	%	
Wound complications							
Cellulitis	1	2.13	0	0.00	0	0.00	—
Delayed wound healing	1	2.13	0	0.00	0	0.00	—
Infected hardware	0	0.00	0	0.00	1	2.56	—
Total	2	4.26	0	0.00	1	2.56	.75
Venous thromboembolism							
Deep vein thrombosis	2	4.26	0	0.00	0	0.00	—
Pulmonary embolism	1	2.13	1	9.09	1	2.56	—
Total	3	6.38	1	9.09	1	2.56	.98

Table 5. Univariate and Multivariate Analyses for Risk Factors for Postoperative Wound Complication Among Cohort

Variable	Wound Complication				Univariate Analysis: OR (95% CI)	P
	Yes (n = 14)		No (n = 447)			
	n	%	n	%		
Demographics						
Sex						
Male	9	64	147	33	3.67 (1.21-11.16)	.02 ^a
Female	5	36	300	67		
Age						
<70 y	9	64	208	47	2.07 (0.68-6.23)	.28 ^b
≥70 y	5	36	239	53		
Comorbidities						
Hypertension						
Yes	14	100	308	69	No data	.008 ^a
No	0	0	139	31		
Diabetes						
Yes	6	43	80	18	3.44 (1.16-10.19)	.03 ^b
No	8	57	367	82		
Hyperlipidemia						
Yes	5	36	138	31	1.20 (0.41-3.78)	.77 ^b
No	9	64	309	69		
Coronary artery disease						
Yes	5	36	68	15	3.10 (1.00-9.52)	.05 ^b
No	9	64	379	85		
Other cardiac						
Yes	2	14	46	10	1.45 (0.32-6.69)	.65 ^b
No	12	86	401	90		
Prior venous thromboembolism						
Yes	3	21	22	5	5.23 (1.37-20.25)	.04 ^a
No	11	79	425	95		
Gout						
Yes	1	7	15	3	2.22 (0.27-18.05)	.40 ^b
No	13	93	432	97		
Calcification						
Calcification						
Yes	3	21	93	21	1.04 (0.28-3.80)	>.99 ^b
No	11	79	354	79		
Above joint only						
Yes	2	14	45	10	1.45 (0.32-6.86)	.64 ^b
No	12	86	402	90		
Below joint only						
Yes	0	0	11	3	No data	>.99 ^b
No	14	100	436	97		
Both						
Yes	1	7	37	8	0.85 (0.12-6.70)	>.99 ^b
No	13	93	410	92		

Abbreviations: CI, confidence interval; OR, odds ratio.
^aSignificant in multivariate analysis and Fisher exact test.
^bSignificant in Fisher exact test only.

TKA remains a postoperative complication.¹⁹ This study also found that a considerable percentage of primary TKA patients (23.59%) had preoperative calcification of the knee arteries.

To our knowledge, this study was the first to quantify the incidence of knee arterial calcification in patients who underwent TKA.

Table 6. Univariate Analysis for Risk Factors for Postoperative Venous Thromboembolism Among Cohort

Variable	Venous Thromboembolism				Univariate Analysis: OR (95% CI)	P
	Yes (n = 21)		No (n = 440)			
	n	%	n	%		
Demographics						
Sex						
Male	7	33	149	34	0.98 (0.39-2.47)	>.99
Female	14	67	291	66		
Age						
<70 y	10	48	207	47	1.02 (0.43-2.46)	>.99
≥70 y	11	52	233	53		
Comorbidities						
Hypertension						
Yes	16	76	306	70	1.41 (0.50-3.90)	.63 ^a
No	5	24	134	30		
Diabetes						
Yes	3	14	83	19	0.72 (0.21-2.49)	.78 ^a
No	18	86	357	81		
Hyperlipidemia						
Yes	5	24	138	31	0.68 (0.25-1.90)	.63 ^a
No	16	76	302	69		
Coronary artery disease						
Yes	3	14	70	16	0.88 (0.25-3.07)	>.99 ^a
No	18	86	370	84		
Other cardiac						
Yes	5	24	43	10	2.89 (1.01-8.26)	.06 ^a
No	16	76	397	90		
Prior venous thromboembolism						
Yes	3	14	22	5	3.17 (0.87-11.57)	.10 ^a
No	18	76	418	9		
Gout						
Yes	2	10	14	3	3.20 (0.68-15.11)	.16 ^a
No	19	90	426	97		
Calcification						
Calcification						
Yes	5	24	91	21	1.20 (0.43-3.36)	.78 ^a
No	16	76	349	79		
Above joint only						
Yes	3	14	44	10	1.50 (0.43-5.30)	.46 ^a
No	18	86	396	90		
Below joint only						
Yes	1	5	10	2	2.15 (0.26-17.63)	.41 ^a
No	20	95	430	98		
Both						
Yes	1	5	37	8	0.55 (0.07-4.17)	>.99 ^a
No	20	95	403	92		

Abbreviations: CI, confidence interval; OR, odds ratio.

^aSignificant in Fisher exact test.

Preoperative calcification of the knee arteries in patients who underwent TKA did not increase the risk for wound complication, VTE, or arterial damage. These calcifications, however, do pose an increased systemic vascular risk.²⁰ Calcification of the vascular wall predicts increased cardiovascular risk, independent of classical cardiovascular risk factors.^{3,18,21-24} Clinically, patients who have both diabetes and calcifications are at significant excess risk for total mortality, stroke mortality, and cardiovascular mortality, compared with patients with diabetes but without such calcifications. They also had a significantly higher incidence of coronary heart disease events, stroke events, and lower extremity amputations.^{25,26}

All our patients underwent tourniquet-assisted TKA. Although previous studies have indicated that tourniquet use may increase arterial complications and wound complications or even limb loss in patients with calcified arteries, we did not find this link.^{7,27} Our population had no reported arterial complications related to tourniquet use. Other, smaller studies have had similar findings. Vandenbussche and colleagues²⁸ prospectively studied 80 TKA cases randomized to tourniquet use or no tourniquet use and found no postoperative nerve palsies, wound infections, wound healing problems, or hematomas. Our study is also in accord with studies that have reported tourniquet use did not increase risk for DVT.²⁹ Therefore, unlike earlier data, our data demonstrated that tourniquet use in patients with knee arterial calcification was safe.^{7,27,30,31}

Patients with calcification were more likely to have the medical comorbidities of hypertension, diabetes, hyperlipidemia, and CAD. All these comorbidities are linked to the development of arterial calcification, or atherosclerotic occlusive disease.^{32,33} As life expectancy and the need for TKA increase, it is likely that a larger percentage of TKA patients will have preoperative radiographic evidence of knee arterial calcification. Although current dogma is that tourniquet-assisted TKA is contraindicated for patients with preoperative radiographic evidence of femoral-popliteal calcification, our study results showed that this calcification should not affect preoperative TKA planning for these patients.

We divided our patients into 3 categories: those with proximal calcification (above the joint line), those with distal calcification (below the joint line), and those with both proximal and distal calcification. Location of arterial calcification did not have an effect on their rates of postoperative wound complication or VTE. We hypothesized that patients with proximal calcification would be at increased risk for direct arterial injury and subsequent wound complication because the tourniquet is placed proximally. Previous research has indicated that arterial occlusion and subsequent wound complication can occur because of low blood flow stemming from tourniquet use.⁷ Further, intraoperative manipulation (flexing) of a knee with calcified vessels causes arterial complications after TKA because these vessels are less elastic than nonatheromatous vessels.³¹ However, we found no such effect. At the same time, having arterial calcification might also be an indication of venous disease in this location,¹² which may be especially important for proximal calcifications. Proximal DVT more likely is a precursor

to pulmonary embolic events than distal DVT is.^{31,34} However, we found no difference in VTE rates among the 3 arterial location groups, which is supported by studies that have found that tourniquet use does not increase DVT incidence.^{29,35-40}

Risk for wound complications was higher in male patients and in patients with diabetes, prior VTE, hypertension, or CAD. This finding is important because, with the increasing age of patients who undergo TKA, those with serious medical comorbidities will continue to need and have this surgery.¹⁷ Diabetes may increase the rate of wound complication because patients with diabetes have poor microcirculation, poor collagen synthesis, and reduced wound strength.⁴¹ Malinzak and colleagues⁴² demonstrated that, compared with patients without diabetes, those with diabetes had a significantly higher risk for infection after TKA. Prior VTE, specifically DVT, may increase the rate of wound complication because after DVT the deep veins may be damaged and exhibit valvular dysfunction. Labropoulos and colleagues⁴³ showed that DVT history was strongly associated with ulcer nonhealing. Perhaps hypertension has been overlooked as a risk factor for wound complication in TKA. No previous studies have assessed the link between hypertension and wound complications after TKA. However, a study of wound healing after total hip arthroplasty found that, compared with normotensive patients, hypertensive patients had delayed wound healing, putting them at higher risk for infection.⁴⁴ In addition, we found that patients with CAD were at increased risk for wound complications—an unexpected finding, as CAD traditionally is not a risk factor for infection or poor wound healing. Recently, however, CAD was identified as an independent risk factor for surgical site infections in posterior lumbar-instrumented arthrodesis.⁴⁵ The etiology of this association is unknown. Also, male patients were at increased risk for wound complication. Male sex has been implicated as an independent risk factor for development of surgical site infections and has been established as an important predisposing factor for periprosthetic joint infections.⁴⁶

It is possible that patients who present with diabetes, VTE, hypertension, or CAD before TKA should have a consultation with a vascular surgeon or should have TKA performed without a tourniquet, but this conclusion cannot be considered definitive without a large prospective randomized trial or possibly registry data. Our data indicate that patients with these comorbidities have higher rates of wound complications irrespective of preoperative radiographic calcifications. On the basis of our study results, however, we certainly recommend that patients with these risk factors have preoperative medical optimization. Orthopedic surgeons should take a thorough history and perform a meticulous physical examination on these patients to look for evidence of PVD. We recommend that, if vascular claudication is elicited in the history, or if there is evidence of peripheral arterial disease—such as hair loss, skin discoloration, dystrophic nail changes, or absent or unequal peripheral pulses—the ankle-brachial index test should be performed. If the index value is less than 0.9, then a preoperative vascular surgery consultation should be obtained.

This study had some weaknesses. First, it was retrospective,

so it is possible that some wound or VTE complications were not reported and thus not found in the paper charts or electronic medical records. Some patients may have had VTE diagnostic scans at other hospitals, and their results may not have been recorded across databases. Moreover, some patients may have seen wound specialists for wound infections or wound healing problems, and these may not have been reported to the orthopedic surgeons. Second, though our patient population was not small, it may not have been of adequate size to fully detect statistical significance. We met our enrollment numbers based on our sample size calculations from an a priori power analysis; however, we still draw conclusions with the possibility of committing a type II error in mind by failing to reject the null hypothesis when in reality a statistically significant difference does exist. Third, none of our consecutive patients carried the preoperative diagnosis of PVD, and none had preoperative vascular surgery. Therefore, though calcifications were noted on radiographs, clinically our patients were asymptomatic with respect to vascular health. Last, the 2 groups were not randomized. All patients underwent tourniquet-assisted TKA.

Conclusion

To our knowledge, this is the largest study to examine the effect of preoperative knee arterial calcification on wound complication and VTE after tourniquet-assisted TKA. Contrary to previously published recommendations, we conclude that TKA can be safely performed with a tourniquet in the presence of preoperative radiographic evidence of such calcification. However, we recommend that patients with diabetes, hypertension, CAD, or prior VTE undergo an appropriate physical examination to elicit any signs or symptoms of vascular disease. If before surgery there is any question of vascular competence, a vascular surgeon should be consulted.

Dr. Koehler is House Staff Surgeon, Mr. Fields and Ms. Noori are Medical Students, Dr. Weiser is House Staff Surgeon, Dr. Moucha is Assistant Professor of Orthopaedic Surgery, and Dr. Bronson is Associate Professor of Orthopaedic Surgery, Leni and Peter W. May Department of Orthopaedic Surgery, Mount Sinai Medical Center, New York, New York.

Address correspondence to: Calin S. Moucha, MD, Leni and Peter W. May Department of Orthopaedic Surgery, Mount Sinai Medical Center, 5 E 98th St, 7th Floor, Box 1188, New York, NY 10029 (tel, 212-241-1461; fax, 212-241-9710; email, calin.moucha@mountsinai.org).

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