Risk Factors of Deep Vein Thrombosis (DVT) after Total Knee Arthroplasty (TKA) at Phramongkutklao Hospital

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Background: *There have been sporadic reports on the Asian risk factor of DVT after total knee arthroplasty.*
Objective: *To determine the risk factors of DVT.*
Material and Method: *Retrospective review of one hundred patients who had undergone TKA and postoperative Contrast Venography in bilateral legs between 2002 and 2005 were performed to identify risk factor of DVT. The patients were divided into two groups, positive and negative venography which the patients who had positive venography were indicating the development to DVT.*
Results: *One hundred patients were evaluated associated to DVT. Eighteen of these patients were men, and eighty-two were women. The median age at the time of the procedure was seventy-five years old (range: 62 - 79 years old). Sixty-one patients showed positive venography for DVT. Five critical risk factors were identified to develop DVT:*

1. *Underlying cardiovascular disease*
2. *Underlying hematological disease*
3. *Underlying rheumatoid arthritis*
4. *Patients who took oral herbal medicine about one year before the operation*
5. *Patients who received revision TKA.*

Conclusion: *The risk factors of DVT in the presented patients at Phramongkotklo Hospital were similar to other countries. The research study could identify statistically significant risk factors and stimulate surgeons undertaking TKA to be aware of the probability of the patient to develop DVT.*

Keywords: *Risk Factors, DVT, TKA*

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Total knee arthroplasty is a common orthopedic procedure that is performed to treat arthritis that is unresponsive to non-operative management. This procedure is considered generally safe, with a very low rate of complications. A major complication commonly found is DVT.

Many studies have reported the risk factors such as trauma, tumor, and TKA for DVT in orthopedic surgery. However, most of the studies were done in Western countries and few studies were carried out in Asian countries[1-5]. The important risk factors of DVT include age, obesity, steroid, contraceptives used, and underlying diseases.

The purpose of the present study was to define the risk factor of DVT in Thai people in Pharamongkutklao Hospital who underwent total knee arthroplasty.

Material and Method

A retrospective clinical review was performed for patients who underwent TKA and who had Contrast - Venograms postoperative investigation for DVT between October 2002 and October 2003 at Phramongkutklao Hospital. All patients underwent TKA by the same surgeon and investigated to detect

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DVT in both legs with Venography 7-10 days post operative by the same radiologist.

After having the Contrast - Venography, the patients were divided into two groups. The first group had positive - venography, indicating the development of DVT. The second group had negative - venography, indicating normal studies.

One hundred patients had performed the test. The records of these patients were reviewed with regard to age, gender, body mass index, hormonal therapy, steroids - herbal use, NSAIS - drugs used, and underlying diseases. All variables were present and analyzed to find the risk factor of DVT by statistical method.

Results

One hundred patients who had a TKA between 2002 and 2003, had contrast - venography performed post operatively[1]. Eighteen of these patients were men, and eighty-two were women. The average age at the time of the procedure was seventy-five years old (range: 62-79 years old).

Sixty-one patients had positive venography and thirty-nine patients had negative venography. All variable probably to risk factor are identified in Table 1.

When these variables for DVT were analyzed, it was found that five statistically significant variables were identified to risk factor: 1) underlying cardiovascular disease, 2) underlying hematological disease, 3) underlying rheumatoid arthritis, 4) patients who took oral herbal medicine about one year before the operation, and 5) patients who received revision TKA (Table 2).

Discussion

DVT is a complication commonly found after TKA operation among Western patients[6-9]. All of the reports were analyzed based on Western patients.

A study by Virchow in 1859 concluded that the occurrence of DVT had been linked to the following three clinical conditions: 1) Being in the stage of hypercoagulability, 2) sustaining vascular endothelial injury, and 3) having venous stasis[6]. In the present

Table 1. Results of variable and deep vein thrombosis

	Variable	DVT + Ve (%) Number	%	DVT – Ve (%) Number	%
1	Sex				
	Male	8	(13.1)	10	(25.6)
	Female	53	(86.9)	29	(74)
2	Age (yrs)				
	Age ≥ 70	23	(37.7)	13	(33.3)
	Age < 70	38	(62.3)	26	(66.7)
3	Primary / Revision surgery				
	Primary surgery	57	(93.4)	37	(94.9)
	Revision	4	(6.6)	2	(6.1)
4	Side of surgery				
	Left	36	(59.0)	26	(66.7)
	Right	25	(41.0)	13	(33.3)
5	Obesity				
	BMI ≥ 25 kg/M^2	44	(72.1)	24	(61.5)
	BMI < 25 kg/M^2	17	(27.9)	15	(38.5)
6	Hormone therapy				
	Oral contraceptive	1	(1.6)	1	(2.6)
	No oral contraceptive	60	(98.4)	38	(97.4)
7	Steroid herbal				
	Herbal	37	60.7	7	17.9
	No herbal	24	39.3	32	82.1
8	Underlying gout				
	Yes	2	3.3	1	2.6
	No	59	(96.7)	38	(97.4)
	Total	61	100	39	100

Table 1. (Cont.)

	Variable	DVT + Ve (%) Number	%	DVT – Ve (%) Number	%
9	Underlying hypothyroid thyroid				
	Yes	1	1.6	1	2.6
	No	60	98.4	38	97.4
	Total	61	100	39	100
10	Underlying stroke (cardiovascular accident)				
	Yes	1	1.6	0	0
	No	60	98.4	39	100
	Total	61	100	39	100
11	Underlying varicose vein				
	Yes	3	4.9	2	5.1
	No	58	95.1	37	94.9
	Total	61	100	39	100
12	Underlying malignancy				
	Yes	4	6.6	2	5.1
	No	57	93.4	37	94.9
	Total	61	100	39	100
13	Underlying heart disease				
	Yes	16	26.2	8	20.5
	No	45	73.8	31	79.5
	Total	61	100	39	100
14	Underlying hematologic disease				
	Yes	2	3.3	0	0
	No	59	56.7	39	100
	Total	61	100	39	100
15	Underlying hypertension				
	Yes	39	(63.9)	21	53.8
	No	22	36.1	18	46.2
16	Underlying DM				
	Yes	13	(21)	4	(10.3)
	No	48	(78.7)	35	(89.7)
17	Underlying rheumatoid arthritis				
	Yes	0	(0)	5	(12.8)
	No	61	(100)	34	(87.2)
	Total	61	100	39	100
18	All NSAID				
	NSAID	53	(86.9)	37	(94.9)
	No NSAID	8	(13.1)	2	(5.1)
19	Rofecoxib				
	Rofecoxib	43	(70.5)	28	(71.8)
	No Rofecoxib	18	(29.5)	11	(28.2)
20	Celecoxib				
	Celecoxib	23	(37.5)	12	(30.8)
	No Celecoxib	38	(62.5)	27	(69.2)
21	Selective cox - 2				
	Selective cox - 2	2	(3.3)	5	(12.8)
	No selective cox - 2	59	(96.7)	34	(87.2)
22	General NSAID				
	General NSAID	4	(6.6)	4	(10.3)
	No General NSAID	57	(93.4)	35	(89.7)

Table 2. Result of the variable statistically significant risk factor of DVT

	Risk factor	Number (Persons)	DVT		
			Number	percent	Cohort study, odds ratio (95%CI)
1	Underlying				
	Yes	1	1	1.6	1.650 (1.408-1.934)
	No	99	60	98.4	1
2	Underlying hemotological disease				
	Yes	2	2	3.3	1.661 (1.414-1.951)
	No	98	59	96.7	1
3	Underlying rheumatoid Arthritis				
	Yes	5	0	0	2.794 (2.134-3.658)
	No	95	61	100	1
4	Herbal				
	Herbal	44	37	60.7	7.048 (2.683-18.513)
	No Herbal	56	24	39.3	1
5	Primary/Revision surgery				
	Revision	6	4	6.6	1.694 (1.988-1.426)
	Primary	94	57	93.4	1

research study, risk factors for DVT were statistically significant and corresponded to one or more of Virchow triad in patients with underlying stroke or cardiovascular accident and in patients with underlying homological disease, and were linked to hypercoagulability stage, with excessive blood clotting that developed into a thrombus in the vascular systems. The rather slow flow of blood in the vein also contributes to the occlusion. The same is true in patients with a history of taking steroids that reduces a plasma protein, e.g. antithrombin III that prevents blood clotting, leading to development of thrombosis.

Revision surgery in TKA cases is linked to the occurrence of severe vascular endothelia injury because of the need to remove bone and a large amount of soft tissue trauma, making it a statistically significant risk factor[6,9,10]. Similarly, those with underlying rheumatoid arthritis are likely to suffer vascular endothelial injury through the immune process if synovitis developed around the joint. It would create a cyst such as Baker's cyst that would be mechanical in putting pressure at the poplitial area, leading to venous stasis and the occurrence of thrombosis[10-13].

As for other factors that are not related to Vischow triad, or not directly linked to the three conditions, the study extends to statistically significant factors such as old age (> 70), sex, obesity (BMI > 25), history of NSAIDs drug, gouty arthritis and hypothyroidism.

But in other cases, as taking oral contraceptive pills, patients with underlying hypertension, diabetes mellitus, malignant tumor and varicose vein, which are related to irchow traid and are found to be not statistically significant, the reason could be the small number of population, the different effect of various oral contraceptive pills on vascular system, the good control of hypertension and diabetes mellitus to minimize their effect on vascular endothelial, while patients with malignancy could be the types that are not related to blood clotting[12,13].

Nonetheless, the research study could identify statistically significant risk factors and stimulate surgeons undertaking TKA to be aware of the probability of the patient to develop DVT, as well as help them in administering prophylaxis anticoagulant[1,14]. It should be considered worthwhile in terms of cost-effectiveness for patients and medical centers in the currents economic and social condition.

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Table 3. Result of the variable not statistically significant

	Risk factor	Number (Persons)	DVT		
			Number	percent	Cohort study, odds ratio (95%CI)
1	Sex				
	Female	82	53	86.9	2.280 (0.812-6.425)
	Male	18	8	13.1	1
2	Age (yrs)				
	≥ 70	36	23	37.7	1.211 (0.521-2.814)
	< 70	64	38	62.3	1
3	Side of surgery				
	Right	38	25 (41.0)	41.0	0.720 (0.311-1.666)
	Left	62	36 (59.0)	59.0	1
4	Obesity (kg/m^2)				
	BMI < 25	32	17 (27.9)	27.9	1.618 (0.689-3.800)
	BMI ≥ 25	68	44 (72.1)	72.1	1
5	Hormonal therapy				
	Yes	98	60 (98.4)	98.4	0.633 (0.38-10.430)
	No	2	1 (1.6)	1.6	1
6	Underlying gout				
	Yes	3	2 (3.3)	3.3	1.288 (0.113-14.703)
	No	97	59 (96.7)	96.7	1
7	Underlying thyroid				
	Yes	2	1 (1.6)	1.6	0.633 (0.38-10.430)
	No	98	60 (98.4)	98.4	1
8	Varicose vein	5	3 (4.9)	4.9	0.957 (0.153-6.002)
	No varicose vein	95	58 (95.1)	95.1	1
9	Malignancy	6	4 (6.6)	6.6	1.298 (0.226-7.449)
	No Malignancy	94	57 (93.4)	93.4	1
10	Heart disease	24	16	26.2	1.378 (0.525-3.613)
	No heart disease	76	45	73.8	1
11	Hypertension	60	39	63.9	1.519 (0.670-3.444)
	No hypertension	40	22	36.1	1
12	Diabetes mellitus	17	13	13	2.370 (0.712-7.887)
	No diabetes mellitus	63	48	48	1
13	NSAID	90	53	86.9	0.358 (0.561-13.906)
	No NSAID	10	8	13.1	1
14	Rofecoxib	71	43	70.5	0.938 (0.561-13.906)
	No rofecoxib	25	18	29.5	1
15	Celecoxib	35	23	*	0.938 (0.438-2.590)
	No celecoxib	75	38	*	1
16	Selective Cox - 2	7	2	*	0.230 (0.798-23.582)
	No Selective Cox - 2	93	59	*	1
17	General NSAID	8	4		0.613 (0.383-6.932)
	No General NSAID	92	57		1

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ปัจจัยเสี่ยงในการเกิดลิ่มเลือดอุดตันในหลอดเลือดดำ (DVT) หลังจากการผ่าตัดเปลี่ยนข้อเข่าในโรงพยาบาลพระมงกุฎเกล้า

ธไนนิธ โชตนภูติ, พิพัฒน์ องค์น้ำทิพย์, ทวี ทรงพัฒนาศิลป์, ภูวดล วีระพันธุ์, คฑาวุธ ดีปรีชา

ภูมิหลัง: *เนื่องจากมีรายงานเรื่องความเสี่ยงในการเกิด DVT ในเอเชียอย่างต่อเนื่อง*
วัตถุประสงค์: *เพื่อประเมินปัจจัยเสี่ยงของ DVT*
วัสดุและวิธีการ: *การศึกษาแบบย้อนหลัง (Retrospective) ในคนไข้จำนวน 100 คน ที่มีการผ่าตัด TKA และมีการทำ contrast venography ที่ขาหลังการผ่าตัด ในระหว่างปี พ.ศ. 2545 – พ.ศ. 2546 เพื่อหาปัจจัยเสี่ยงในการเกิด DVT ผู้ป่วยถูกแบ่งเป็น 2 กลุ่ม กลุ่มแรกมี positive – venography ถูกประเมินว่ามีโอกาสจะเกิด DVT กลุ่มที่สองมี negative – venography เป็นกลุ่มปกติ*
ผลการศึกษา: *ในผู้ป่วยจำนวน 100 คนที่มีโอกาสเสี่ยงต่อการเกิด DVT เป็นผู้ชายจำนวน 18 คน และผู้หญิง 82 คน อายุเฉลี่ยอยู่ที่ 75 ปี (อายุระหว่าง 62–79 ปี) มีผู้ป่วยจำนวน 61 คนที่มี positive – venography ในขณะที่ 39 คน เป็น negative – venography ปัจจัยเสี่ยงหลัก 5 ปัจจัยที่ทำให้เกิด DVT มีดังนี้คือ 1) มีโรคทางหลอดเลือดหัวใจแฝงอยู่ 2) มีโรคทางเลือดแฝงอยู่ 3) มีโรคไขข้อแฝงอยู่ 4) ผู้ป่วยที่รับประทานสมุนไพรมามากกว่า 1 ปีก่อนการผ่าตัด และ 5) ผู้ป่วยที่ได้รับ revision TKA*
สรุป: *ปัจจัยเสี่ยงต่อการเกิด DVT ในผู้ป่วยที่โรงพยาบาลพระมงกุฎเกล้า เป็นปัจจัยเดียวกับที่พบในประเทศอื่น ๆ การศึกษานี้แสดงปัจจัยเสี่ยงที่สำคัญทางสถิติ และกระตุ้นให้ศัลยแพทย์ผู้ทำ TKA ให้ระวังถึงโอกาสที่เป็นไปได้ที่ผู้ป่วยจะเกิด DVT ได้*