Incidence and risk factors of clinically important venous thromboembolism in tibial plateau fractures

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Background There are multiple reports on venous thromboembolism (VTE) for major orthopaedic surgery. The incidence and risk factors of VTE in tibial plateau fractures reported less commonly. This study aimed to investigate the incidence and risk factors of clinically important venous thromboembolism(CIVTE) in patients with tibial plateau fractures.

Methods A total of 462 patients aged 18 years and older were retrospectively identified as undergoing operative fixation of tibial plateau fractures from 2003 to 2018. All the suspected CIVTE patients were examined by the ultrasonography or/and CT scan. Univariate and multivariate analysis were used to assess the association in patient's demographics between CIVTE and no VTE. Variables that were significant at $P < 0.05$ in univariate analyses entered into a multivariable logistic regression model to evaluate the risk factors.

Results Thirty-nine (8.4%) of 462 patients developed CIVTE in 75.5%(394/462) of patients with the chemical prophylaxis. Pulmonary embolism (PE) and deep vein thrombosis DVT was examined in 18 (3.9%) and 21(4.54%) patients respectively.

Table1 Incidence of CIVTE

Variable	N (%)
VTE	39(8.44%)
DVT	21(4.55%)
Upper extremity DVT	8(1.73%)
Lower extremity DVT*	13(2.81%)
PE	18(3.90%)
DVT with PE	2(0.43%)

Table 2 Demography of patients with CIVTE and no VTE

variable	No VTE	CIVTE	total	P value
Gender				
Male	274 (64.8%)	35 (89.7%)	309 (66.9%)	0.02
Open fracture				0.021
Yes	34(8.0%)	8(20.5%)		
no	389(92%)	31(79.5%)		
Classification				0.002
I-III	237(56.0%)	12(30.8%)		
IV-VI	186(42.3%)	27(69.2%)		
Associated injury (multi-injury)				
Traumatic brain Injury	13(3.1%)	11(28.2%)		0.000*
Chest injury	23(5.4%)	9(23.1%)		0.000*
Abdomen injury	13(3.1%)	4(10.3%)		0.066*
Pelvic fractures	27(6.4%)	10(25.6%)		0.000*
Spine injury	13(3.1%)	15(38.9%)		0.000*
Extremity injury	104(24.6%)	23(59.0%)		0.000*

Comorbidities				
Cancer	8(1.9%)	5(12.8%)		0.001
Fixation methods				0.000
One-staged	287(67.8%)	14(35.9%)		
Two-staged	136(32.2%)	25(64.1%)		

Touiquenet				0.042
Yes	239(56.5%)	15(38.5%)		
No	184(43.5%)	24(61.5%)		
ICU				0.000
YES	34(8.0%)	24(38.5%)		
No	389(92%)	15(61.5%)		
Injury to definite operation	7.9±7.6	13.7±10.6	8.38±8.07	0.000
Operation to discharge	8.5±12.5	21.7±22.5	9.65±14.06	0.001
Length stay in ICU	0.9±4.0	10.3±14.2	14.33±11.54	0.000
Prophylaxis				
Yes	313(74%)	36(92.3%)		0.010
No	110(26.0%)	3(7.7%)		

Tips:All the $p > 0.05$ were not included in the table.

Table 3. VTE prophylaxis and therapeutic methods

medication with/without IVF	prophylaxis	treatment
Enoxaparin	40mg-60mg daily	80-120mg daily
Heparin	NA	5000U bid-5000 tid
Warfarin	NA	Depends on the INR
Aspirin	375mg daily	NA
Enoxaparin/VC F	40mg-60mg daily/IVF	80-120mg daily/IVF

Table 4 risk factors of CIVTE in tibial plateau fractures

	β	S. E	Wals	p	Exp (β)	95%CI	
Gender(male: female)	2.422	.777	9.723	.002	11.267	2.459	51.637
Traumatic brain injury	1.564	.764	4.189	.041	4.777	1.069	21.359
Associated spine injury	2.252	.546	17.027	.000	9.506	3.262	27.703
Associated extremity injury	1.307	.441	8.789	.003	3.695	1.557	8.769
Length stay in ICU	.096	.029	11.167	.001	1.101	1.040	1.164
From injury to definite operation	.060	.021	8.163	.004	1.062	1.019	1.106

Conclusions The incidence of CIVTE in tibial plateau fracture was high (8.4%); The males, associated with traumatic brain injury, associated with spine injury, associated with extremity injury, the time from injury to definite operation, length stayed in ICU were the independent risk factors.

Limitations

Our study has several limitations. First, the main limitation of the current study is its retrospective nature. Some predictive variables may not have sufficient statistical power, or some important variables may have been ignored. Second, 462 patients during a 15-year period study, such a long period with relatively small sample size may weaken the power to study the incidence of CIVTE. Additionally, the period of the study was relatively long, the guideline of the VTE prophylaxis has changed in several times, which might influence the strategy of VTE prophylaxis and treatment.

*: All the lower DVT located in the proximal vein