Deep Vein Thrombosis in Iraqi Spinal Cord Injured Patients

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ABSTRACT:

BACK GROUND:

Spinal cord problems is an important complication of spinal cord injury. Deep vein thrombosis is a critical sequel & need early diagnosis and management.

OBJECTIVE:

To determine the frequency and time of occurrence of deep vein thrombosis (DVT) in Iraqi Spinal Cord Injured patients, and a possible etiologic relationship between DVT and Spinal Cord Injuries (SCI) types.

METHODS:

One hundred nine Iraqi patients with spinal cord injury admitted at Ibn_Alkuff SCI Hospital from the 1st of January till 30th of June 2006 were studied, full history was taken and complete clinical examination was done for all patients. DVT was diagnosed by physical examination and confirmed by Doppler ultrasound. Special scales and scores were included in this study to assess spinal cord injury impairment (American spinal injury association scale/score and Modified Ashworth spasticity scale).

RESULT:

A total sample of 109 Iraqi patients were included in this descriptive cross sectional study, 100 males (91.7%) and 9 females (8.3%), the age of patients ranged from 11 to 65 years (mean 33.8 years), the disease duration ranged from 1 to 240 months (mean 20.5 months). Eleven patients (10.1%) were having DVT (were male patients).Our study showed statistically significant association between the presence of deep vein thrombosis and neurological level of spinal cord injury, flaccidity and ASIA scale (A and B). (p=0.011, p=0.017 and p=0.006 respectively) Our results showed no statistical significant association between age, gender, duration of spinal cord injury and causes of spinal cord injury in determining the presence of DVT. (p=0.71, p=0.36, p=0.68 and p=0.34 respectively)

CONCLUSION:

DVT is more likely to develop in Iraqi spinal cord injured patients who have a lumbar neurological level of injury or who have flaccid paralysis. Also SCI patients with ASIA scale A and B are more liable to develop DVT. These groups of patients needs close observation and monitoring.

KEYWORDS: vein thrombosis; spinal cord injury .

INTRODUCTION:

Deep vein thrombosis (DVT) is a frequent and serious complication of spinal cord injury (SCI)[1]*Virchow's* concluded that thrombi formed in the systemic veins and that thrombosis was caused primarily by three factors: reduced blood flow in the systemic veins, injury to the veins and a state of hypercoagulability. These factors are known collectively as *Virchow's triad*[2].Spinal cord injury is damage to the spinal cord that causes loss of sensation and motor control and it is considered as one of the most devastating of all traumatic conditions that can be encountered by patients and their carers[3]. The spinal cord is a cylindrical, grayish structure that begins above at the foramen magnum and terminates below the level of the lower border of the first lumbar vertebrae. It occupies 2/3 of vertebral column and its 18 inch (45 cm) in length [4]. It is estimated that there are approximately 40,000 patients in the UK with a SCI, equating to a prevalence of around 1 in 1500, injured in a Road

Traffic Accident (about 36.8% of all SCIs), a fall (41.7%), an act of violence (2.7%), or a sporting accident (11.6%) [5]. According to several studies DVT occurs in up to one-third of patients [6, 7] and most frequently occurred between day 5 and 12 after the injury [14]. In the era before prophylaxis with unfractionated heparin the incidence of DVT was up to 70%. Even with low molecular weight heparin prophylaxis the incidence of DVT in acute SCI still about 10 %[8]. The most serious complication of DVT is pulmonary embolism which occurs in 8% to 14% of patients with acute SCI, with a mortality rate of 2.5% to 4.7 %[9]. Complications of DVT that may lead to significant morbidity include post thrombotic syndrome, prolonged edema, pressure ulcers, and may also be

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a source of spasticity or autonomic dysreflexia[10].

PATIENTS AND METHODS:

This is a cross-sectional descriptive study carried out at Ibn_Alkuff SCI Hospital (Baghdad). One hundred and nine patients were included in this study. Patients without neurological deficits, with cerebral pathology, myelopathies, congenital paralysis, herniation of intervertebral discs and psychiatric disorders were excluded from this study. Full history was taken from all patients, Data included information on patients demographics, neurological level of injury, type of injury ,muscle tone and data on each classification criteria were collected {American Spinal Injury Association impairment scale (ASIA scale)[11], Modified Ashworth Spasticity scale (Ash scale) } and complete clinical examination was done for all of them. Rehabilitation occurring at least two months after the event of the SCI was considered as re-rehabilitation. Neurological status of each patient was graded according to ASIA impairment scale into A, B, C, D or E grade Also we have ASIA impairment score for Functional assessment of SCI patients calculated according to a standardized formula [11]. Spasticity grading of patients was done according to Modified Ashworth Spasticity Scale as shown in Table (1).

Diagnosis of DVT: DVT was suspected when a staff member (physician, physiotherapist, nurse) on the daily ward rounding noticed a physical change as localized swelling (mainly of the lower leg), temperature differences, redness and tenderness of calf muscle. DVT diagnosis was confirmed by Doppler Ultrasound. If prophylaxis against DVT was in use at the time of admission to rehabilitation, the type of prophylaxis was recorded. A signed consent was taken from all patients for admission to the study.

Statistical analysis: All data coded and entered to computer, analyzed by SPSS 10 (statistical package of social science). Data summarized in numbers, percentages and mean ± standard deviation (SD). Association between different variables was measured by chi-square test and t_test when it's appropriate. P value less than 0.05 ($P<0.05$) considered as level of significance.The demographic distribution of our109 SCI patients is shown in Table (2).

Table: 1 Modified Ashworth Spasticity Scale (Ash scale).

Ashworth scale	Findings on Examination
0	No increase in muscle tone
1	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end range of motion when the part is moved in flexion or extension/abduction or adduction, etc.
1+	Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM
2	More marked increase in muscle tone through most of the ROM, but the affected part is easily moved
3	Considerable increase in muscle tone, passive movement is difficult
4	Affected part is rigid in flexion or extension (abduction or adduction, etc.)

Table: 2 Demographic distributions of patients.

Variables	Patients
Number	109
Age (years) (mean ± SD)	33.81±11.95
<20 years No. (%)	11 (10.1)
20-44 years No. (%)	75 (68.8)
45-65 years No. (%)	23 (21.1)
Gender Male No. (%)	100 (91.7)
Female No. (%)	9 (8.3)
Duration of injury (months) (mean ± SD)	20.52±45.31
1st rehabilitation No.(%)	38 (34.9)
Re-rehabilitation No.(%)	71 (65.1)
Cause of Injury*	
BI No.(%)	77 (70.6)
FFH No.(%)	16 (14.7)
RTA No.(%)	16 (14.7)
Neurological level	
Cervical No.(%)	27 (24.8)
Thoracic No.(%)	60 (55.0)

Lumbar No.(%)	22 (20.2)
Type of Paralysis	
Paraplegia No.(%)	82 (75.3)
Tetraplegia No.(%)	27 (24.7)
Type of Injury	
Complete No.(%)	78 (71.6)
Incomplete No.(%)	31 (28.4)
Muscle tone	
Flaccid No.(%)	33 (30.3)
Spastic No.(%)	76 (69.7)

* BI: Bullet Injury. FFH: Fall From Height. RTA: Road Traffic Accident.

RESULTS:

A total sample of 109 patients with traumatic SCI was included in this study; demographic distribution of those patients according to presence of DVT is shown in Table (3). Eleven patients (10.1%) were having DVT, while 98 patients (89.9%) have no DVT. Nine of those patients (9.2%) with no DVT were female and 89 patients (90.8%) were male, while all patients with DVT were male. (P=0.36) Mean age of patients with no DVT was (33.96±12.18) years, while mean age of patients with DVT was (32.55±10.11) years and there was no statistically significant association between presence DVT and age (P=0.71) Studying the duration of SCI in relation to the presence DVT shows that patients with no DVT have a mean SCI duration of (19.92±41.97) months, while patients with DVT have a mean SCI duration of (25.91±71.11) months with no statistically significant difference. (P=0.68) Causes of SCI in our patients were bullet injury (BI) in 77patients (70.6%), fall from height (FFH) in 16 patients (14.7%) and road traffic accident (RTA) in 16 patients (14.7%) and there was no statistically significant difference between them in determining the presence of DVT. (p=0.34) Neurological examination of our patients as shown in Table (4) shows that 25 patients (92.6%) with cervical level, 57 patients (95.0%) with thoracic level and 16 patients (72.7%) with lumbar level have no DVT, While 2 patients (7.4%) with cervical level, 3 patients (5.0%) with thoracic level and 6 patients (27.3%) with lumbar level were having DVT Presence of DVT among various levels prove to be significance. (p=0.011) Seventy three paraplegic patients (89.0%) have no DVT, compared to 9(11.0%) had DVT. Twenty five tetraplegic patients (92.6%) have no DVT, compared to 2(7.4%) have DVT with no significant differences between the two groups in determining the presence of DVT. (P=0.45) Seventy one patients (91.0%) with complete SCI have no DVT, while 7 patients (9.0%) have DVT. Twenty seven patients (87.1%) with incomplete SCI have no DVT, while 4 patients (12.9%) have DVT with no significant differences. (P=0.38) We found that 26 patients (78.8%) with flaccid paralysis have no DVT, while 7 patients (21.2%) have DVT and 72 patients (94.7%) with spastic paralysis have no DVT, while 4 patients (5.3%) have DVT so the association between muscle tone and the presence of DVT is significant. (p=0.017) The association between Ash scale and the presence of DVT is shown in Table (5), Twenty six patients (78.8%), 25 patients (92.6%), 14 patients (93.3%), 19 patients (95.0%), 10 patients (100.0%) and 4 patients (100.0%) fulfills the criteria of grade 0, 1, 1+, 2, 3 and 4 respectively have no DVT, compared to 7 patients (21.2%), 2 patients (7.4%), 1 patient (6.7%) and 1 patient (5.0%) were grade 0, 1, 1+ AND 2 respectively have DVT so there is no significant association between the grades of Ash scale and the presence of DVT. (p=0.217) Coping with type of injury ASIA scale shows that 71 patients (91.0%), 6 patients (60.0%), 13 patients (100.0%) and 8 patients (100.0%) of grade A, B, C and D respectively have no DVT, compared to 7 patients (9.0%) and 4 patients (40.0%) of grade A and B respectively have DVT the differences between ASIA scale (A and B) compared to (C and D) in determining the presence of DVT are significant . (p=0.006) Studying the ASIA score for both motor and sensory in relation to the presence of DVT shows that patients with no DVT have a mean score for motor of (50.36±15.96), while it is (57.84±25.01) for sensory.Patients with DVT have a mean score of (50.00±23.24) for motor and (67.82±30.94) for sensory with no significant differences between ASIA scores in determining the presence of DVT. (p=0.94 for motor), (p=0.22 for sensory)

Table: 3 Demographic distributions of patients according to presence or absence of DVT.

Variables 109 SCI patients	DVT		P value
	negative	positive	
Age (years)(mean ± SD)	33.96±12.18	32.55±10.11	0.71*
<20 years No.(%)	11 (100%)	0 (0.00%)	
20-44 years No.(%)	66 (88.0%)	9 (12.0%)	0.45*
45-65 years No.(%)	21 (91.3%)	2 (8.7%)	
Gender Male No.(%)	89 (89.0%)	11 (11.0%)	0.36*
Female No.(%)	9 (100%)	0 (0.0%)	
Duration of injury(months) (mean ± SD)	19.9±41.97	25.91±71.11	0.68*
1st reh. ≤ 2m No.(%)	32(84.2%)	6 (15.8%)	0.13*
Re-reh. >2m No.(%)	66 (93.0%)	5 (7.0%)	
Cause of Injury**			
BI No.(%)	68 (88.3%)	9 (11.7%)	0.34*
FFH No.(%)	16 (100%)	0 (0.0%)	
RTA No.(%)	14 (87.5%)	2 (12.5%)	

* P-value <0.05 indicates significance
** BI: Bullet Injury. FFH: Fall From Height. RTA: Road Traffic Accident.

Table: 4Neurological findings in relation to presence or absence of DVT.

Variables	DVT		P value
	negative	positive	
Neurological level			
Cervical No.(%)	25 (92.6%)	2 (7.4%)	
Thoracic No.(%)	57 (95.0%)	3 (5.0%)	0.011*
Lumbar No.(%)	16 (72.7%)	6 (27.3%)	
Type of Paralysis			
Paraplegia No.(%)	73 (89.0%)	9 (11.0%)	0.455*
Tetraplegia No.(%)	25 (92.6%)	2 (7.4%)	
Type of Injury			
Complete No.(%)	71 (91.0%)	7 (9.0%)	0.382*
Incomplete No.(%)	27 (87.1%)	4 (12.9%)	
Muscle Tone			
Flaccid No.(%)	26 (78.8%)	7 (21.2%)	0.017*
Spastic No.(%)	72 (94.7%)	4 (5.3%)	

* P-value <0.05 indicates significance

Table: 5 Association between DVT presence and special scales.

Variables	DVT		P value
	negative	positive	
Ash scale			
Grade 0 No. (%)	26 (78.8%)	7 (21.2%)	
Grade 1 No. (%)	25 (92.6%)	2 (7.4%)	
Grade 1+No.(%)	14 (93.3%)	1 (6.7%)	0.217*
Grade 2 No. (%)	19 (95.0%)	1 (5.0%)	
Grade 3 No. (%)	10 (100%)	0 (0.0%)	
Grade 4 No. (%)	4 (100%)	0 (0.0%)	
ASIA scale			
Grade A No. (%)	71 (91.0%)	7 (9.0%)	
Grade B No. (%)	6 (60.0%)	4 (40.0%)	0.006*
Grade C No. (%)	13 (100%)	0 (0.0%)	
Grade D No. (%)	8 (100%)	0 (0.0%)	
ASIA score			
Motor (mean ± SD)	50.36±15.96	50.00±23.24	0.947*
Sensory (mean ± SD)	57.84±25.01	67.82±30.94	0.223*

* P-value <0.05 indicates significance

DISCUSSION:

Our study reported that 10.1% of patients with SCI have DVT which goes with previous studies [1, 8] earlier studies showed different incidences of DVT in SCI, ranging from 10% up to 100%[1].This high incidence in SCI is in contrast to that observed in pedestrians without SCI, and is related to an elevated venous resistance and a diminished venous blood flow, both raising the risk of DVT [12], while. In this study there were no statistical significant difference between 1st rehabilitation versus re-rehabilitation in determining the presence of DVT (p=0.13), while other study [14] showed the risk of DVT during 1st rehabilitation was significantly higher than during re-rehabilitation. Also in this study there was no statistical significant association between age and the presence of DVT, which is different from the finding of other author [13] which showed that older patients are more liable to develop DVT than younger patients. The difference between our study and previous studies explained on basis of small sample of patients in our study and most of them are young patients, a wide scale study is indicated in the future. In the present study there was no statistical significant difference between gender and Causes of SCI in determining the presence of DVT which goes with other studies [14, 15]. Neurological examination of our patients revealed statistically significant association between lumbar neurological level of injury compared to other levels and the presence of DVT. (p=0.011) Also there was a statistical significant association between flaccidity and of the presence DVT (p=0.017), which is in agreement with other study [16]. This can be explained on the basis that spasticity is presumably protective because it may be associated with a decrease in venous capacitance. [17].Our study showed statistically significant association between patients having ASIA scale (A and B) with presence of DVT. (p=0.006)

CONCLUSION:

Deep Vein Thrombosis is more likely to develop in Iraqi spinal cord injured patients who have a lumbar neurological level of injury or who have flaccid paralysis. Also SCI patients with ASIA scale A and B are more liable to develop DVT.

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