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To Study the Incidence of Deep Venous Thrombosis in Neuroparalytic Patients

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ABSRACT

INTRODUCTION- Deep vein thrombosis (DVT) is a widespread complication. Venous thromboembolism (VTE) consists of two interrelated conditions caused by blood clots, notably deep vein thrombosis (DVT) and pulmonary embolism (PE). The current study is to investigate incidence and risk factors associated with DVT in neuroparalytic patients caused by stroke and trauma. This is important as timely intervention can prevent morbidity and mortality. It will also help in formulation of guidelines for prevention of DVT.

MATERIAL AND METHODS- A total of 84 patients were prospectively enrolled in this study with acute neuro paralysis between Nov 2018 to June 2020. These patients were analyzed with respect to various clinical and demographic factors in accordance with Autar risk scale. Patients included in this study were screened with venous duplex scan on 5^{th} and 10^{th} day from the onset of symptoms.

RESULTS- The study included 84 patients out of which, 54(64.3%) were male and 30(35.7%) were female. Mean age of the patients included in this study was 56.45 ± 15.75 years. Hemorrhagic CVA caused paralysis in 69(82.1%) patients, while patients due to spinal injuries and head injury were 10(11.9%) and 5(6%) respectively. Only 1 out of 84 patients developed asymptomatic deep vein thrombosis (Anterior tibial vein thrombosis) on venous duplex scan on 10^{th} day. According to Autar risk scale, out of 84 patients, 53 patients had moderate risk to develop DVT, 19 patients were in high-risk category. 28 patients in this study had a history of Type-2 Diabetes mellitus. There was no significant difference of risk in Diabetic and non-diabetic patients according to Autar risk scale. A total of 59 patients presented with previous history of hypertensive. There was a significant difference of risk in HTN and non HTN patients according to Autar risk scale. (P-value - 0.023). Only 2(2.4%) patients presented with history of COPD. There was no significant difference of risk in smoker and nonsmoker patients according to Autar risk scale.

CONCLUSION- Incidence of early DVT in neuroparalytic patients is very low. Hypertension and diabetes were found to be the most common co- morbidities.

Keywords- deep vein thrombosis, pulmonary embolism

I. INTRODUCTION

Deep vein thrombosis (DVT) is a widespread complication. Deep vein thrombosis is often overlooked, but it is potentially preventable disorder that affects mostly hospitalized patients due to immobility. The risk factors for VTE include major surgery, spinal cord injury, fracture of the pelvis, hip or long bones; multiple trauma, malignancy, congestive heart or respiratory failure, myocardial infarction, prior VTE, advancement in age, obesity, immobility, varicose veins, pregnancy and puerperium, use of oral contraceptives, antiphospholipid antibody syndrome, and such hereditary risk factors as antithrombin and protein C and S deficiencies. Paralyzed patients have a relatively high risk of deep vein thrombosis (DVT) because of immobility not only in paralyzed limb but also in other limb as well. DVT is associated with increased mortality and morbidity. In the International Stroke Trial (IST), 0.8% of patients who did not receive thrombosis prophylaxis developed a clinically apparent pulmonary embolism (PE) within the first 2 weeks after stroke onset. PE accounts for 13% to 25% of early deaths after stroke. Therefore, current study is to investigate incidence and risk factors associated

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with DVT in neuroparalytic patients caused by stroke and trauma. This is important as timely intervention can prevent morbidity and mortality. It will also help in formulation of guidelines for prevention of DVT.

II. MATERIALS AND METHODS

This prospective study included all consecutive paralytic patients due to trauma, stroke or acute inflammatory neurogenic pathology admitted in SRMS- IMS, Bareilly between Nov 2018 to Jun 2020. All patients participating in the study underwent baseline evaluation of routine blood investigations coagulation parameters after admission. Patients with confirmed neuroparalytic conditions were included in the study. All the patients were categorized into four categories i.e., high/moderate/low/no risk categories according to Autar risk scale.

The scale consists of seven distinct categories –

1. Age
2. Mobility
3. Body mass index
4. Special risk
5. Trauma risk
6. Surgical intervention
7. High-risk diseases.

The score of the Autar scale ranged from zero to 30. Autar risk scale classified into four levels-

1) ≤ 6 indicate to no risk
2) 7-10 at low risk
3) 11-14 at moderate risk
4) ≥15 was at high risk for deep vein thrombosis development.

The validity and reliability of Autar risk scale was tested through correlation coefficient alpha which was 0.98 (Autar, 1994).

Ultrasonographic assessment- As per our protocol, all patients underwent color doppler ultrasound utilizing the 5 to 10 MHz linear transducer in real time B mode on 5^{th} and 10^{th} day to look for Deep vein thrombosis. The Doppler examined bilateral Common femoral (CFV), superficial femoral (SFV), Popliteal, Anterior tibial and Posterior tibial veins in longitudinal and transverse plane. Flow, visualized thrombus, probe compressibility and augmentation were seen during the Doppler study. The results were assessed by an experienced radiologist.

Patients were given mechanical prophylaxis in terms of physiotherapy and in some patients' pneumatic compression devices. None of the patients in the study received chemoprophylaxis.

PATIENT SELECTION:

Inclusion criteria: All consecutive patients with diagnosis of neuroparalytic condition after stroke, spinal cord injury or acute paralytic disorders at SRMS-IMS, Bareilly between Nov 2018 to June 2020.

Exclusion criteria:

1. Participants having major medical/ or surgical illness predisposing to DVT. (e.g. – Malignancy).
2. Patients with a history of recent immobilization (within 4 weeks) either because of surgery or any other medical reason.
3. Patients with pre-existing DVT.
4. Patients with paralysis of >1 week duration.
5. Patients on anti-coagulants and anti-platelet agents

Statistical analysis

All the data were collected in a proforma and tabulated in MS excel (2007) sheet. The data was analysed by SPSS data base with application of student independent t-test. P-value <0.05 was considered significant and p-value <0.001 was considered statistically highly significant.

III. OBSERVATION AND RESULTS-

On the basis of selected criteria, the following observations were made

Diagnosis	**Number**	**Percentage (%)**
CVA	69	82.1%
Spinal injuries	10	11.9%
Head injuries	5	6%
Total	**84**	**100%**

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Limb involvement	Patients
Quadriplegia	4
Paraplegia	2
Hemiplegia	9
Paresis(Quadri/Para/Hemi)	69
Total	84

Duration of symptoms	Number	Percentage (%)
<1 day	37	44.1%
1-2 days	19	22.6%
2-3 days	11	13.1%
3-4 days	5	6.0%
4-5 days	12	14.2%
Total	84	100%

Mobility	Patients	Autar risk score
Limited (uses self-aid)	0	1
Very limited (needs help)	19	2
Chair-bound	26	3
Bed ridden	39	4

CO-MORBIDITIES	NUMBER	PERCENTAGE (%)
DM WITH HTN	26	31%
DM	2	2.4%
HTN	33	39.2%
CAD	0	0.0%
COPD	2	2.4%
SMOKING	21	25%
PAST H/O STROKE	0	0.0%

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PEDAL EDEMA	NUMBER	PERCENTAGE(%)
PRESENT	38	45.2%
NO	46	54.8%
Total	84	100.0%

Venous Duplex scan (On 5th& 10th day)	Number	Percentage (%)
Evidence of DVT	1	1.2%
No evidence of DVT in both scans	83	98.8%
Total	84	100.0%

Autar risk scale	Patients	Percentage(%)
High risk	19	22.6%
Low risk	7	8.3%
Moderate risk	53	63.1%
No risk	5	6.0%
Total	84	100.0%

AUTAR RISK SCALE IN DM									
RISK FACTORS	HIGH RISK(n=19)		LOW RISK(n=7)		MODERATE RISK(n=53)		NO RISK(n=5)		P-Value
DM	Number	%	Number	%	Number	%	Number	%	
YES	8	29	0	0	19	68	1	4	0.463(not significant)
NO	11	20	7	13	34	61	4	7	

AUTAR RISK SCALE IN HYPERTENSION					
Risk factor	HIGH RISK (n=19)	LOW RISK(n=7)	MODERATE RISK (n=53)	NO RISK (n=5)	P-Value

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HTN	No.	%	No.	%	No.	%	No.	%	
YES	14	23.7	2	3.4	42	71.2	1	1.7	0.023 (significant)
NO	5	20	5	20	11	44	4	16	

AUTAR RISK SCALE IN COPD									
Risk factor	HIGH RISK(n=19)		LOW RISK(n=7)		MODERATE RISK(n=53)		NO RISK(n=5)		P-Value
COPD	No.	%	No.	%	No.	%	No.	%	
YES	0	0	0	0	2	100	0	0	0.575 (not significant)
NO	19	23.2	7	8.5	51	62.2	5	6.1	

AUTAR RISK SCALE IN SMOKING									
Risk factor	HIGH RISK(n=19)		LOW RISK(n=7)		MODERATE RISK(n=53)		NO RISK(n=5)		P-Value
SMOKING	No.	%	No.	%	No.	%	No.	%	
YES	6	27.3	1	4.5	14	63.6	1	4.5	0.976 (not significant)
NO	13	21	6	9.7	39	62.9	4	6.1	

The study included 84 patients out of which, 54(64.3%) were male and 30(35.7%) were female. Mean age of the patients was 56.45 ± 15.75 years. 32(38%) patients were from elderly age group i.e., >60 years and 27(32.14%) patients were in between 51-60 years of age. 48(57%) patients belonged to average weight category, 29(35%) patients from overweight category, 5(6%) patients were from obese category.

Hemorrhagic CVA caused paralysis in 69(82.1%) patients, while patients due to spinal injuries and head injury were 10(11.9%) and 5(6%) respectively. Almost half of the patients (44.1%) presented within 24 hours of disease onset. 46.4% were on complete bed rest, approximately 31% patients were chair-bound, and 22.6% patients needed help for movement. 38 patients developed pedal edema, while 46 patients showed no such sign. One patient with pedal edema developed asymptomatic DVT of Anterior tibial vein thrombosis on Venous Duplex scan on 10th day. According to Autar risk scale, out of 84 patients, 53

patients had moderate risk to develop DVT, 19 patients were in high-risk category.

59 patients presented with a previous history of hypertension, out of which 26 patients also had a history of Diabetes Mellitus. 25% of patients in the study group were chronic smokers. No patients in the study group had a previous history of coronary artery diseases or stroke. 28 patients had history of Type-2 Diabetes mellitus. Among these diabetic patients, 8 patients were from high-risk category, 19 patients from moderate risk category, 1 from no risk category. There was no significant difference of risk in Diabetic and non-diabetic patients according to Autar risk scale. Hypertension was the most frequent co-morbidity among these patients. A total of 59 patients presented with previous history of hypertensive in which 14 patients were from high risk category, 42 patients from moderate risk category, 2 patients had low risk and 1 patient had no risk of developing DVT.There was a significant difference of risk in HTN and non HTN patients according to Autar risk scale. (P-value – 0.023). Only 2(2.4%) patients presented with history of COPD and both of them had moderate risk, and none had high, low risk and no risk according to Autar risk scale. In rest 82(97.6%) patients, there was no history of COPD but according to Autar risk scale, 51(62.2%) patients were in moderate risk category and19(23.2%) patients were in high risk category. As there were only 2 patients in COPD group, it would be wrong to draw a conclusion on COPD versus non-COPD risk profile. Only 2(2.4%) patients presented with history of COPD and both had moderate risk, and none had high, low risk and no risk according to Autar risk scale. Out of 84 patients in the study group, 22(26.2%) patients had history of chronic smoking. In these patients, 6(27.3%) patients were in high-risk category, 14(63.6%) patients were in moderate risk category, 1(4.5%) patient were in low risk and no risk each according to Autar risk scale. There was no significant difference of risk in smoker and nonsmoker patients according to Autar risk scale.

IV. DISCUSSION

Deep vein thrombosis is one of major preventable cause of morbidity and mortality in neuroparalytic patients. The annual incidence of DVT is approximately 0.1% in the general population, 1.3% among hospitalized patients, and 1.8% among elderly patients between 65 and 69 years old. Deep vein thrombosis has been observed as early as 2nd day of paralysis to as late as 42 months in stroke. Highest risk is thought to be within the first two weeks, specially the first week after onset of paralysis. Neurosurgical patients are at moderate risk for venous thromboembolism. Increased incidence has been observed in patients with co-morbidities, decreased mobility and critical illness and several factors have been proposed to be responsible.

Aim of our study was to find out the incidence of early DVT in neuroparalytic patients, to identify groups at risk and to initiate therapeutic measures to prevent morbidity and mortality. We also tried to identify the probable risk factors behind DVT for its prevention.

The present study observes a very low incidence of DVT in patients with acute paralysis - 1.2% (1 out of 84 patients). Patients were not sub grouped based on etiopathogenesis of paralysis but were mostly of haemorrhagic CVA, followed by spinal injuries and head injury. Incidence of DVT among patients with hemorrhagic stroke was 1.4% i.e., 1 in 69 patients with hemorrhagic stroke. **Elias Skaf et al** reviewed the data of hospitalized patients with hemorrhagic and ischemic stroke from 1979 to 2003 and found the incidence to be 1.37% (22,000 in 1,606,000 patients) in hemorrhagic stroke. Similarly, Gregory et al reported the incidence of DVT to be 1.9% and **Stecker et al** reported VTE incidence to be 1.3% in stroke patients.

However, **Ruijun Ji et al** in his study on stroke patients found incidence of DVT to be 1.9% in acute ischemic stroke, 5.7% in intracerebral haemorrhage and 7.9% in subarachnoid haemorrhage. Lacut et al reported 15.9% incidence up to 10 days after ICH development. Reason for variation in the incidence is not clear and maybe multifactorial. Ethnicity of the study group might possibly be a contributing factor. Patients with haemorrhagic stroke are often quite serious and have a prolonged hospital stay. This might itself contribute to a higher incidence.

Patients having paralysis secondary to spinal injury were small in number and there were no patients who developed DVT. **Alibrahim F et al** and **Akeda K** found a rather low incidence of DVT in patients with acute spinal injury and patients undergoing spinal surgery. Similarly, **Piran S et al** also found low incidence in these patients.

Paola et al performed a retrospective study in a total of 155 patients with severe traumatic brain injury and found an incidence of DVT in 19(12.26%) patients. but in our study group only 5 patients, during the study period, with head injury fulfilled the inclusion criteria, which is a low sample size to draw a conclusion.

Overall, in acute onset neuro-paralysis, our study group reported lower incidence of DVT than described in literature. The incidence matches with the findings of some series but lower than others, particularly in haemorrhagic stroke. In neurotrauma, we observed no DVT in such cases. Low incidence might be a true reflection of disease burden or possibly be due to small sample size because of inherent time constraints. Another possible explanation is - we included only patients who developed significant paralysis (Power =/<2/5) following head injury and proportion of such patients were less. We also excluded paralyzed patients having predisposing conditions like previous strokes, DVT, recent surgery etc. Besides aggressive physiotherapy, to prevent the morbidity of bed-ridden states also has a preventive effect on DVT. This all explains the low or nil incidence of DVT in our study, the mean age of study group was 56.45 years (±15.75). 38% patients were 60+ age group. We did not observe any DVT in this group. Literature reports that the incidence of thromboembolic events increases with age. Patients older than 65 years of age are twice at risk of developing DVT. **Kshettry and Rosenbaum et al** reported that the risk of developing DVT in patients >65 years of age and between 40–65 years were 2.0 and 1.6 times, respectively, in comparison to patients of less than 40 years of age. **Semrad et al** also found older age as an important independent risk factor for the development of DVT. Our findings differ with the literature and suggest DVT has no correlation with age.

As our study group was predominantly based on acute paralytic patients, most of the patients were either chair-bound or completely bed-ridden. These patients were subjected to extensive physiotherapy and pneumatic compression devices as a prophylaxis. Only one patient in the study group developed DVT in the affected limb, thus suggesting low incidence even in presence of paralysis.

John et al found motor weakness to be associated with development of the DVT and embolism, with more risk in patients with quadriparesis. **Ogata et al**, in his study on DVT in acute intra cerebral hemorrhage, found a very high incidence i.e. 40.2%, at 2 weeks and concluded that patients with DVT had more severe paralysis and disturbance of consciousness than those who did not. **Abelsth et al** studied prospectively DVT in surgically managed cases of fractures distal to hip in 102 patients and found 28% incidence of occult DVT with 4 symptomatic VTE. In a prospective study on the risk of DVT in long term wheelchair bound or bedridden patients suffering from Multiple sclerosis, **Arpaia et al** found 43.9% patients affected with DVT. Finding of our study contrasts with the available literature. Regular physiotherapy and frequent use of compressive bandages might have helped in prevention of DVT.

Among 84 patients in the study group, hypertension was the most common comorbidity in 59 (70%). 26 of the hypertensive patients also presented with history of Diabetes Mellitus type-2. **Alanazi OA et al** and **Alzayed AS**, both conducted a cross-sectional study among patients with DVT and analyzed relation of DVT and hypertension. Both study concluded an increased association of DVT in patients with hypertension. Huang L in a prospective study found twofold increased risk of DVT in hypertensive orthopedic patients. In accordance to Autar risk assessment scale, we studied risk association of hypertension to DVT and also found a significant difference of risk in hypertensive and non-hypertensive patients. (P-value- 0.023)

In our study, 28 patients presented with history of Type-2 DM but none of them developed DVT. **Piazza G et al** in his study on patients suffering from venous thrombo embolism, found increased risk of recurrent DVT in patients with Type-2 Diabetes Mellitus and they were more likely to suffer than patients without diabetes. Diabetic patients are also more prone for DVT in presence of co- morbidities like hypertension, advanced age, malignancy etc. Chung WS conducted a cohort study to evaluate effects of Diabetes mellitus in developing DVT and reported 1.4 fold increased risk of thromboembolism. Though we did not encounter DVT in any of the diabetics, the risk in diabetics versus non-diabetics did not differ much (P-value – 0.463).

Patients with history of COPD were found to be at 1.3-fold increased risk for developing DVT in comparison to non-COPD patients in a study conducted by **Chen C Y et** al, but only 2 patients in our study presented with known history of COPD, so calculation of actual incidence of DVT in these patients could not be done.

Among the various factors, patients with history of chronic smoking were analyzed. Although in a meta-analysis by **Mi Y et al**, risk of DVT in smokers was found to be increased, we found no significant difference of risk in smokers and non-smokers. (P-value – 0.976)

In our study, only 5 patients were from obese category with BMI ranging from 31-40 and none of the patient developed DVT. Small sample size could not rule out the possibility of risk of developing DVT in later stages of life in these patients as Yang G et al found twofold increased

risk of developing DVT in obese patients (BMI>35).

V. CONCLUSION

Overall, incidence of venous thrombosis seems to be low and preventive strategies might further help in lowering the new onset DVT in acute paralysis. Incidence of early DVT in neuroparalytic patients is very low. Hypertension and diabetes were found to be the most common co-morbidities. A larger study is required to reach a definite conclusion.

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