



ROLE OF COLOUR DOPPLER STUDY FOR EVALUATION OF LOWER LIMB DEEP VEIN THROMBOSIS

Radio-Diagnosis

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ABSTRACT

Introduction- Deep vein thrombosis is a common clinical problem. It can endanger life of a person by producing pulmonary embolism and may cause venous hypertension, and chronic venous insufficiency. **Aim-** Evaluation of patients with suspected deep vein thrombosis by using color Doppler ultrasonography. **Method-** After obtaining clearance from Institute's ethical committee, all the patients fulfilling the inclusion criteria were selected and written consent is obtained. They will be investigated with color Doppler using GE logic P9 and P5 ultrasound machine's high frequency linear transducer. The protocol begins with the patient in supine position from upper thigh till foot with longitudinal and transverse scanning to examine the veins from the common iliac veins down to calf veins. **Results-** In our study 50 patients with clinically suspicion of lower limb deep vein thrombosis were subjected for Doppler examination. Out of all the patients the maximum incidences of deep vein thrombosis were noted in the age group of 31-50 yrs. i.e. 48%, and minimum incidence in the age group of 11-30 yrs. i.e. 14%. The age group of 51-70 yrs. had 22% of patients and that of 71-90 yrs. of age group had 16% of patients out of total patients in the study. Out of all the patients it was found that majority of the patients were male 78% while incidence in female patients is 22%. Out of 50 suspected patients of deep vein thrombosis 60% of them were found to be positive or presence of deep vein thrombosis and 40% of them had negative or absence of deep vein thrombosis. Deep vein thrombosis was more common in right extremity i.e. 50% then left extremity i.e. 46%. Only 4% of patients had bilateral involvement. **Conclusion-** Deep vein thrombosis of lower limbs can be detected reliably, non-invasively and rapidly by the use of colour doppler ultrasonography. Gray scale findings together with colour doppler helps in qualitative evaluation of the venous system of lower limbs and early detection of deep vein thrombosis in clinically suspected. Thus it can be concluded that keeping in mind the limitations, and the advantages offered by the colour doppler ultrasonography, it is a good, reliable, inexpensive and rapid method of investigation for deep vein thrombosis of lower limbs.

KEYWORDS

Deep vein thrombosis, Duplex scan, common iliac veins, calf veins, Lower limb veins Color Doppler ultrasonography.

INTRODUCTION

Deep vein thrombosis is a common clinical problem. It can endanger life of a person by producing pulmonary embolism and may cause venous hypertension and chronic venous insufficiency.

Deep vein thrombosis presents with non specific signs which may be pain, swelling, redness, warmth and engorged superficial veins, which occurs when a blood clot (thrombus) forms in one or more deep veins of the lower limbs this can lead to significant morbidity and mortality.⁽¹⁾

A dramatic presentation of deep vein thrombosis known as Phlegasia Dolens leads to gangrene, shock and death. Failure to detect a deep venous thrombosis, can lead to unfortunate results. Therefore, early diagnosis and treatment of the deep vein thrombosis is necessary to prevent fatal pulmonary embolism and to reduce the occurrence of chronic venous hypertension.

In 1856, German pathologist Rudolf Virchow gave a postulate showing the interrelationship of 3 processes resulting in venous thrombosis, which was named known as Virchow's triad: a decreased blood flow rate (venous stasis), increased tendency to clot (hyper coagulability), and changes to the blood vessel wall. Deep vein thrombosis formation typically begins inside the valves of the calf veins, where the blood is relatively oxygen deprived, which activates certain biochemical pathways.

Several medical conditions increase the risk for deep vein thrombosis, including cancer, trauma, and antiphospholipid syndrome. Other risk factors include older age, surgery, immobilization (due to long bed rest, in patients with orthopedic casts and while taking long flights), oral contraceptives, pregnancy, the postnatal period, and certain genetic factors.⁽²⁾⁽³⁾

Pulmonary thromboembolism is a common sequela and a potentially fatal acute cardiopulmonary disorder. Therefore, accurate diagnosis of deep vein thrombosis is essential not only to prevent excessive

mortality but also to avoid complication related to unnecessary anticoagulant therapy.

Radiological diagnostic modalities for deep vein thrombosis are real time ultrasonographic colour doppler, computed tomography venography, magnetic resonance venography.

Conventional phlebography was being considered as a gold standard of investigation to detect deep vein thrombosis, but it is an invasive procedure and is associated with many complications. Computed tomography venography and magnetic resonance venography. are not available in all hospitals are invasive and not cost effective.

The diagnosis and treatment of deep vein thrombosis has irrevocably been altered after the introduction of Doppler ultrasound (USG) technique. The principle used is that the venous flow pattern of the vein gets distorted due to thrombotic obstruction which is readily detected by the doppler instrument. Doppler ultrasonography can be used in pregnant women, permits multiple views in various positions of leg and it is safe, painless and inexpensive. It is also non-invasive technique and can be repeatedly used, performed rapidly in the clinic, at patient's bedside or even at home and the results are available immediately. The test is useful in high risk patients as a screening modality to ensure early diagnosis and treatment. The duplex scan can diagnose many thrombi at a stage when no major changes have occurred in the venous hemodynamic and the patient is asymptomatic or minimally symptomatic.⁽⁴⁾

Ultrasound provides a reliable method for examining the venous system. It provides accurate diagnosis and extent of thrombus in symptomatic patients. Real time grey scale ultrasound together with Colour Doppler is the commonest modality today, as it does not give any radiation hazard and is cost effective.⁽⁵⁾

Colour doppler (CD) imaging displays the average blood velocity in a vessel, based on the mean Doppler frequency shift of the scatterers (the

blood cells). The echoes from moving scatterers are analysed by the doppler technique separately on a selected window and was been displayed in the same image as colour-coded pixels.⁽⁴⁾

The reports of the above authors have motivated us to take up this study at Dhiraj Hospital, to the Department of Radio diagnosis of SBKS Institute of Medical Sciences, Vadodara, and Gujarat.

AIMS AND OBJECTIVES

AIM

- Evaluation of patients with suspected deep vein thrombosis by using color Doppler ultrasonography.

OBJECTIVES

- To evaluate the spectrum of findings on color duplex ultrasound in patients presented with clinical signs and symptoms of deep vein thrombosis.
- To confirm the presence of thrombosis in clinically suspected patients of deep vein thrombosis.
- To detect the location, extent and status of thrombus to get help in treatment planning.

MATERIALS AND METHODS:-

Study design: Observational study (cross sectional study).

Study Period: 2 years of study period from the date of approval by Ethical committee till June 2018.

Sample size: Whole population will be considered as sample size which will include those patients that will be examined during the study period.

Study Location: Department of Radio diagnosis, Dhiraj Hospital, Pipariya, Vadodara, Gujarat.

Inclusion Criteria

- Only those patients who are willing to participate in study will be included.
- Patients referred to the Radio-diagnosis department for lower limb venous doppler investigation, and found to have positive findings for deep vein thrombosis, will be included in this study.
- All cases needing follow up will also be included in this study.

Exclusion Criteria

Patients who are unwilling to participate in the study will be excluded.

Selection of patients:

Patients who attend the Outpatient Department of Dhiraj Hospital or get admitted in Dhiraj hospital with clinical symptoms and signs with suspicion and finally found to be positive findings of deep vein thrombosis.

Symptoms and signs:-

- Swelling in foot, ankle, or leg, more commonly seen on one side
- Cramping pain in affected leg that usually begins in calf
- Severe, unexplained pain in foot and ankle
- An area of skin that feels warmer than the skin on the surrounding areas
- Skin over the affected area turning pale or a reddish or bluish color

Study Method

They will be investigated with color Doppler using GE logic P9 and P5 ultrasound machine's high frequency linear transducer.

The protocol begins with the patient in supine position from upper thigh till foot with longitudinal and transverse scanning to examine the veins from the common iliac veins down to calf veins.

Extent of thrombus determine by locating the proximal end of thrombus and documenting it with longitudinal and transverse scans.

Colour doppler ultrasound of the lower extremity can be performed quickly by radiologist using a simplified three-point compression technique that concentrates on the evaluation of those areas with highest turbulence and at greatest risk for developing thrombus:

- 1) the common femoral vein at the saphenous junction,
- 2) the proximal deep and superficial femoral veins, and
- 3) the popliteal vein.

RESULT AND OBSERVATIONS

Table 1: Distribution according to Age Group

Age Group	No of patients	Percentage(%)
11-30	7	14.0
31-50	24	48.0
51-70	11	22.0
71 - 90	8	16.0
Total	50	100.0

The table 1 shows the distribution of the patients according to the age group, with maximum number of patients from the age group of 31-50 years (48%) followed by the age group 51-70 years (22%), then in age group 71-90 years (16%) and minimum patients from age group 11-30 (14%). Thus the incidence of DVT is more at the age group of 31-50 years.

Table 2: Distribution according to Gender

Gender	No of patients	Percentage(%)
Male	39	78.0
Female	11	22.0
Total	50	100.0

The table 2 shows the distribution of patients according to the gender showing that number of patients are male (78%) more than female (22%). Thus the incidence of DVT is more in males than females.

Table 3: Distribution according to presence or absence of DVT

DVT	No of patients	Percentage(%)
Present	30	60.0
Absent	20	40.0
Total	50	100.0

The table 3 shows that out of 50 patients of suspected DVT that came for Color Doppler there was presence of DVT in 60% and absence in 40% of patients.

Table 4: Distribution according to Limb involvement

Limb	No of patients	Percentage(%)
Right	25	50.0
Left	23	46.0
Bilateral	2	4.0
Total	50	100.0

Table 4 shows the frequency of involvement of limb, it shows that right limb (50%) is involved more than left limb (46%), and only 4% are with bilateral involvement of limbs.

Table 5: Distribution of patients according to presence of Pre Disposing factors

PRE DISPOSING FACTORS	NO. OF PATIENTS	PERCENTAGE(%)
Smoking	35	70.0
Alcohol	34	68.0
Prolonged bed rest/Hospitalization	14	28.0
Trauma	15	30.0
Surgery	14	28.0
Birth Control Pills	1	2.0
Others	0	0
No cause	4	8.0
Total	50	100

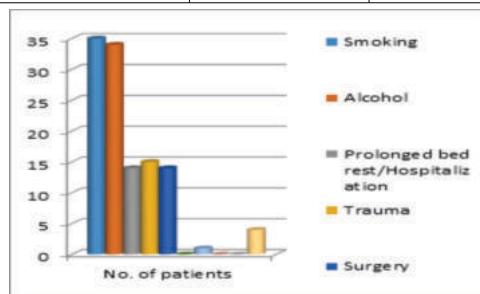


Figure 5: Bar diagram of no. of patients showing presence of Pre Disposing factors

Table 5 shows the distribution of predisposing factors among the patients. The predisposing factor found more are smoking (70%) and alcohol (68%), followed by trauma (30%), surgery (38%), prolonged bed rest (28%) and birth control pills (2%). There were no any patients showing presence of pregnancy, hormonal replacement therapy or any other extravenous causes as predisposing factors and no any cause (8%).

Table 6: Distribution of patients according to presence of Signs and Symptoms

Signs and Symptoms	Present or Absent	No. of patients	Percentage(%)
Pain	Present	29	58.0
	Absent	21	42.0
	Total	50	100.0
Swelling	Present	45	90.0
	Absent	5	10.0
	Total	50	100.0
Warmth	Present	11	22.0
	Absent	39	78.0
	Total	50	100.0
Difficulty in walking	Present	23	46.0
	Absent	27	54.0
	Total	50	100.0

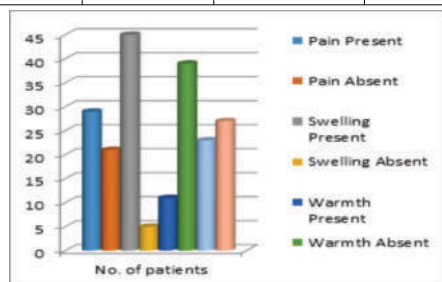


Figure 6: Bar chart showing no of patients with Signs and Symptoms

Table 6 shows the distribution of patients according to the presence of the signs and symptoms of DVT among the patients. There is presence of swelling (90%) more than pain (58%), followed by difficulty in walking (46%) and warmth (22%) among the patients.

Table 7: Distribution of patients according to Veins involved in DVT

Vein involved	Present or Absent	No. of patients	Percentage
CFV	Present	20	40.0
	Absent	30	60.0
	Total	50	100.0
SFV	Present	18	36.0
	Absent	32	64.0
	Total	50	100.0
PV	Present	8	16.0
	Absent	42	84.0
	Total	50	100.0
ATV	Present	3	6.0
	Absent	47	94.0
	Total	50	100.0
PTV	Present	3	6.0
	Absent	47	94.0
	Total	50	100.0

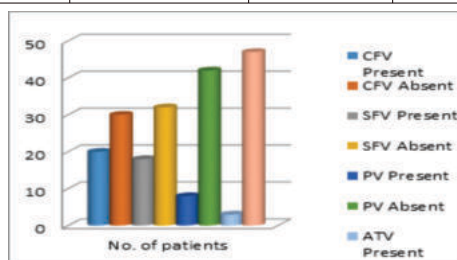


Table 7 shows the distribution of patients according to the involvement

of vein in DVT showing more involvement of CFV (40%) and SFV (36%) followed by PV (16%), ATV (6%) and PTV (6%).

Table 8: Correlation between age group and Predisposing Factors

Predisposing factors	Age Groups				Total
	11-30 yrs	31-50 yrs	51-70 yrs	71-90 yrs	
Smoking	3 (6.0%)	18 (36.0%)	8 (16.0%)	6 (12.0%)	35 (70.0%)
Alcohol	1 (2.0%)	19 (38.0%)	8 (16.0%)	6 (12.0%)	34 (68.0%)
Prolonged bed rest/Hospitalization	4 (8.0%)	4 (8.0%)	4 (8.0%)	2 (4.0%)	14 (28.0%)
Trauma	4 (8.0%)	5 (10.0%)	3 (6.0%)	3 (6.0%)	15 (30.0%)
Surgery	2 (4.0%)	4 (8.0%)	4 (8.0%)	4 (8.0%)	14 (28.0%)
Birth Control Pills	0 (0.0%)	1 (2.0%)	0 (0.0%)	0 (0.0%)	1 (2.0%)
Others	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
No cause	1 (2.0%)	2 (4.0%)	1 (2.0%)	0 (0.0%)	4 (8.0%)
Total	7 (14.0%)	24 (48.0%)	11 (22.0%)	8 (16.0%)	50 (100.0%)

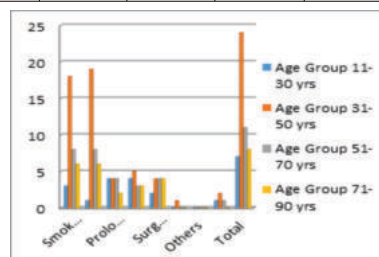


Figure 8: Bar chart for Correlation between Age group and Predisposing Factors

Table 8 shows correlation between age group and predisposing factors showing smoking (6%), alcohol (2%), prolonged bed rest (8%), trauma (8%), surgery (4%) as predisposing factors among 11-30 yrs. of age group. At age group 31-50 yrs. smoking (36%), alcohol (38%), prolonged bed rest (8%), trauma (10%), surgery (8%) and oral contraceptives (2%). At age group 51-70 yrs. smoking (16%), alcohol (16%), prolonged bed rest (8%), trauma (6%), surgery (8%). At age group 71-90 yrs. smoking (12%), alcohol (12%), prolonged bed rest (4%), trauma (6%), surgery (8%).

Table 9: Correlation between Age Group and Signs and Symptoms

Signs and Symptoms	Age Groups				Total
	11-30 yrs	31-50 yrs	51-70 yrs	71-90 yrs	
Pain	3 (6.0%)	14 (28.0%)	7 (14.0%)	5 (10.0%)	29 (58.0%)
Swelling	7 (14.0%)	21 (42.0%)	10 (20.0%)	7 (14.0%)	45 (90.0%)
Warmth	1 (2.0%)	7 (14.0%)	2 (4.0%)	1 (2.0%)	11 (22.0%)
Difficulty in walking	5 (10.0%)	10 (20.0%)	5 (10.0%)	3 (6.0%)	23 (46.0%)
Total	7 (14.0%)	24 (48.0%)	11 (22.0%)	8 (16.0%)	50 (100.0%)

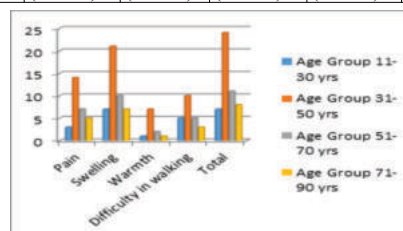


Figure 9: Bar chart for Correlation between age group and Signs and Symptoms

Table 9 shows correlation between age group and signs and symptoms showing that pain (6%), swelling (14%), warmth (2%), difficulty in walking (10%) as signs and symptoms among 11-30 yrs. of age group. At age group 31-50 yrs. pain (28%), swelling (42%), warmth (14%), difficulty in walking (20%) as signs and symptoms. At age group 51-70 yrs. pain (14%), swelling (20%), warmth (4%), difficulty in walking (10%) as signs and symptoms. At age group 71-90 yrs. pain (10%), swelling (14%), warmth (2%), difficulty in walking (6%) as signs and symptoms

Table 10: Correlation between Age Group and Veins involved

Veins Involved	Age Groups				
	11-30 yrs	31-50 yrs	51-70 yrs	71-90 yrs	Total
CFV	3 (6.0%)	13 (26.0%)	3 (6.0%)	1 (2.0%)	20 (400%)
SFV	2 (4.0%)	9 (18.0%)	5 (10.0%)	2 (4.0%)	18 (36.0%)
PV	0 (0.0%)	5 (10.0%)	2 (4.0%)	1 (2.0%)	8 (16.0%)
ATV	0 (0.0%)	1 (2.0%)	2 (4.0%)	0 (0.0%)	3 (6.0%)
PTV	0 (0.0%)	1 (6.0%)	2 (4.0%)	0 (0.0%)	3 (6.0%)
Total	7 (14.0%)	24 (48.0%)	11 (22.0%)	8 (16.0%)	50 (100.0%)

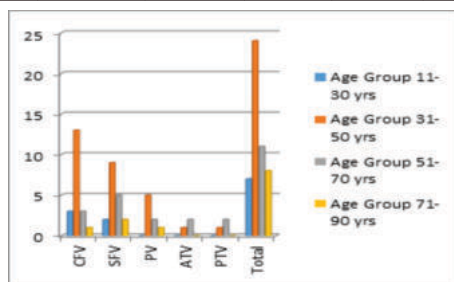


Figure 10: Bar chart for Correlation between age group and Veins Involved

Table 10 shows correlation between age group and veins involved in DVT showing the involvement of CFV (6%), SFV (4%) among 11-30 yrs. of age group. At age group 31-50 yrs. CFV (26%), SFV (18%), PV (10%), ATV (2%), PTV (2%) involvement. At age group 51-70 yrs. CFV (6%), SFV (10%), PV (4%), ATV (4%), PTV (4%) involvement. At age group 71-90 yrs. CFV (2%), SFV (4%), PV (2%) involvement.

Table 11: Correlation between Gender and Predisposing Factors

Predisposing factors	Male	Female	Total
	No. of patients	No. of patients	No. of patients
Smoking	34 (68.0%)	1 (2.0%)	35 (70.0%)
Alcohol	33 (66.0%)	1 (2.0%)	34 (68.0%)
Prolonged bed rest/Hospitalization	10 (20.0%)	4 (8.0%)	14 (28.0%)
Trauma	11 (22.0%)	4 (8.0%)	15 (30.0%)
Surgery	9 (18.0%)	5 (10.0%)	14 (28.0%)
Birth Control Pills	0 (0.0%)	1 (0.2%)	1 (0.2%)
Others	0 (0.0%)	0 (0.0%)	0 (0.0%)
No cause	2 (4.0%)	2 (4.0%)	4 (8.0%)
Total	39 (78.0%)	11 (22.0%)	50 (100.0%)

Table 11 shows correlation between gender and predisposing factors in DVT showing smoking (68%), alcohol (66%), prolonged bed rest (20%), trauma (22%), surgery (18%) and no cause (4%) predisposing factors among male patients. Smoking (2%), alcohol (2%), prolonged bed rest (8%), trauma (8%), surgery (10%), oral contraceptives (2%) and no cause (4%) as predisposing factors among female patients.

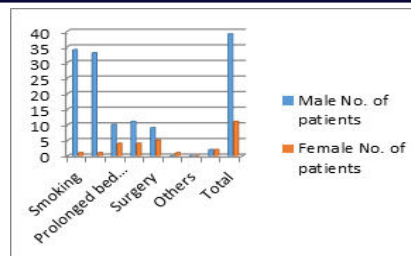


Figure 11: Bar chart for Correlation between Gender and Predisposing Factors

Table 12: Correlation Between Gender and Signs and Symptoms

Signs and Symptoms	Male	Female	Total
	No. of patients	No. of patients	No. of patients
Pain	23 (46.0%)	6 (12.0%)	29 58.0%
Swelling	36 (72.0%)	9 (18.0%)	45 90.0%
Warmth	10 (20.0%)	1 (2.0%)	11 22.0%
Difficulty in walking	17 (34.0%)	6 (12.0%)	23 46.0%
Total	39 (78.0%)	11 (22.0%)	50 100.0%

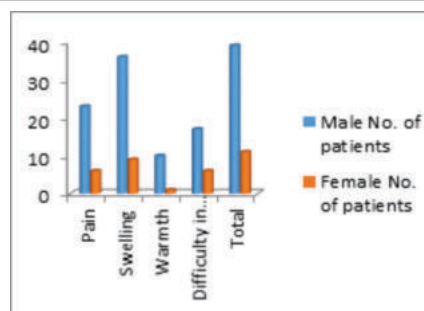


Figure 12: Bar chart for Correlation Between Gender and Signs and Symptoms

Table 12 shows correlation between gender and signs and symptoms showing that pain (46%), swelling (72%), warmth (20%), difficulty in walking (34%) as signs and symptoms among male patients. Pain (12%), swelling (18%), warmth (2%), difficulty in walking (12%) as signs and symptoms among female.

Table 13: Correlation Between to Gender and Veins involved

Veins Involved	Male	Female	Total
	No. of patients	No. of patients	No. of patients
CFV	16 32.0%	48.0%	2040.0%
SFV	14 28.0%	48.0%	1836.0%
PV	510.0%	36.0%	816.0%
ATV	36.0%	00.0%	36.0%
PTV	3 6.0%	00.0%	36.0%
Total	3978.0%	1122.0%	50100.0%

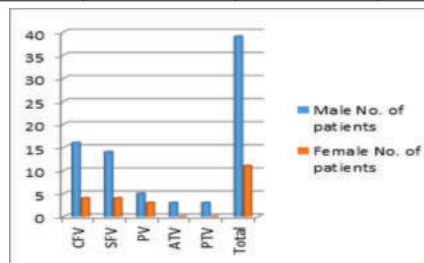


Figure 13: Bar chart for Correlation Between to Gender and Veins involved

Table 13 shows correlation between gender and veins involved in DVT showing the involvement of CFV (32%), SFV (28%), PV (10%), ATV (6%) and PTV(6%) among male patients. CFV (8%), SFV (8%) and PV (6%) involvement among female patients

DISCUSSION

The varied signs and symptoms that are associated with deep vein thrombosis make the diagnosis of deep vein thrombosis difficult and challenging. Furthermore, the thrombi may be asymptomatic making it exceedingly difficult to diagnose on clinical presentation. For proper management of the patients with deep vein thrombosis, the nature, location and the extent of the thrombus is necessary to know, to ensure safe and effective treatment. The study included assessment of spectrum of findings of deep vein thrombosis by using colour doppler ultrasonography.

AGE Group

In my study the youngest patient with deep vein thrombosis was 19 yrs. and eldest patient was of 83 yrs. The mean age of deep vein thrombosis patients in my study was 51 yrs. Our results varied from that of Timothy et al⁽⁶⁾ whose patients ranged between 8 to 98 years with a mean age of 63.2 years.

In my study the age group ranged between 11 years to 90 years with a peak age of 31 to 50 years (26%). In my study no patient was below 10 years.

In the study done by Machi,⁽⁷⁾ the age distribution ranged from 13 years to 77 years with a peak age of 21-30 years. His results were lower compared to my study.

In a similar study done by Kene et al that concentrated on calf vein thrombosis⁽⁸⁾ the age range was from 27-87 years with a mean age of 59.1 years.

Belcaro G et al (2002) Italy in a randomized controlled study found that 100 venous abnormalities increased with increasing age. His reports correlates with my study which shows increase in number of patients from 11-30 yrs. age group to 31-60 yrs. of age group.

Gender

There were 78% male and 22% female patients with clinical presentation of deep vein thrombosis. Thus the male female ratio in the study is 3:1 My reports correlate to the study conducted by Nabeel Ibrahim Atta Almanan who showed there were 76% male and 24% cases female in their study.

Similar observations were made by Sanjay. M. Kalandkar, who showed 74% male and 26% female in their study.⁽⁹⁾ This correlates well with the study conducted by Hill et al.⁽¹⁰⁾ which had higher incidence of deep vein thrombosis among males.

However, contradictory to these findings epidemiological studies of Canonico in 1998 showed prevalence of males to be 17% compared to 35.2% in females; and Capitao in 1995 showed 17.8% males and 34% Female in their study.

Presence or Absence of DVT

Out of 50 clinically suspected patients presented deep vein thrombosis 30(60%) patients were found to be having positive result for deep vein thrombosis and rest 20(40%) of them had negative result for deep vein thrombosis on doppler scanning.

My result differed from the study of Bonass who showed positive deep vein thrombosis in 42.1% of the patients and negative result in 57.9 % out of the 299 patients scanned.⁽¹¹⁾

Limb Involvement

In my study deep vein thrombosis were more common was unilateral involvement of lower limb among 48(96%) cases and bilateral involvement was found in 2(4%) of cases. No case with unilateral symptom had bilateral involvement.

In the similar done by Sanjay. M. Kalandkar, 75 (96.1%) cases with unilateral lower limb involvement, 3 (3.9%) cases with bilateral lower limb involvement. No case with unilateral symptom had bilateral involvement and no case with bilateral symptoms had unilateral involvement in our study.⁽⁹⁾ This correlated well with the study conducted by Sheiman and McArdle⁽¹²⁾ in 1995 who in their study indicated a low incidence of thrombosis in contralateral extremity. The findings match to my study.

In my study deep vein thrombosis were more common in right extremity 25(50%) cases as compared to 23(46%) showed left side

involvement and bilateral involvement was found in 2(4%) of cases.

My study differed from the study of Sanjay. M. Kalandkar, thrombosis amongst the 78 patients (3 cases of bilateral limb involvement), the commonest involvement of the left lower limb. 67 cases (82.7%) and 14 cases (17.3%) with right lower limb involvement.⁽⁹⁾ This also differed from the venographic study conducted by Stamatakis et al.⁽¹³⁾ resulted with more left lower limb involvement.

Signs And Symptoms

The symptoms that prompted for doppler examination were swelling in 45(90%) patients, pain in 29 (58%), difficulty in walking among 23 (46%) and warmth in 11(22%) patients. Among the patients the most common symptom was swelling, followed by pain.

Similar findings were in study by Glover et al (1996)⁽¹⁴⁾, 40% of cases having positive unilateral leg swelling were found to have deep vein thrombosis findings and 5% of patients with absence of leg swelling and positive deep vein thrombosis. This can be explained by the venous physiology that when the major venous channels get occluded, results in increased venous pressure and volume manifest itself as edema Similar findings was in study by Langefeld M et al (1987)⁽¹⁶⁾, leg swelling as the most common symptom in patients diagnosed to have deep vein thrombosis.

Similar study by Sanjay. M. Kalandkar resulted as the majority of the patients with edema (61%) as the most common presenting symptom followed by pain and edema (17%), previous history of deep vein thrombosis (11%), pain (8%) and pulmonary embolism (3%).⁽⁹⁾

This was reflected by Bonass with majority of the patients (42.8%) with leg swelling alone; swelling and pain 27.8%; swelling, pain and warmth 25.4%. Hence, swelling was an important sign (96%).⁽¹¹⁾ This was also reflected by Raghavendra and Rosen et al⁽¹⁷⁾ who also found that limb swelling was the commonest clinical finding (90%) and Raghavendra and Horri too⁽¹⁸⁾ The results of this study compare well with my study.

Predisposing Factors

The predisposing factors found in my study were smoking 35 (70%) and alcohol is 34 (68%). Trauma and surgery was found among 15(30%) and 14(28%) of patients, Prolonged bed rest/ hospitalization 14(28%) and no known predisposing factors in 4 (8%) of patients. These correlated somewhat with study conducted by Heit et al⁽¹⁹⁾ with conclusion that hospital or nursing home confinement, surgery, trauma, malignant neoplasm, chemotherapy are independent and important risk factors for deep vein thrombosis.

DVT

Localisation And Extent Of Thrombosis

Colour Doppler ultrasound helps in exact localization of the thrombus. In my study thrombosis was localized to thigh or popliteal region in 46 (92%) of the total 50 cases.

This was similar to findings of Markel et al.,⁽²¹⁾ proximal limb involvement was more common pattern of involvement as compared to the isolated calf deep vein thrombosis. This roughly correlates to the findings of Hill SL et al (1997), 49% thrombi in the thigh or popliteal region without calf involvement.⁽²²⁾

The distribution of thrombi in my study was- 40% in common femoral vein, 36% in superficial femoral vein, 16% in popliteal vein, 6% in anterior tibial vein and 6% in posterior tibial vein.

This correlates to study by Sanjay. M. Kalandkar showing thrombosis localized to superficial femoral vein 69 (85.2%), common femoral vein 57 (70.3%), popliteal vein 54 (66.66%), posterior tibial vein 49 (60.5%), anterior tibial vein 25 (30.8%), peroneal vein 4(4.9%), external iliac vein 18 (22.22%), common iliac vein 11(13.6%) and the superficial venous system 7 (8.6%).⁽⁹⁾

It differed from findings of Appleman PT et al (1987) and also to Hill SL et al (1997) with involvement of iliofemoral segment 16%, common femoral vein 13%, superficial femoral vein 19%, popliteal vein 18%, calf veins 24% and superficial veins 11%.⁽²²⁾

Correlation Between Age Group And Predisposing Factors.

For the patients of age group 11-30 years the predisposing factor

prevailing more is prolonged bed rest/hospitalization and trauma i.e. 4 patients with each cause out of 7 patients of that age group. Followed by smoking, surgery and alcohol i.e. 3 patients, 2 patients and 1 patient respectively. The patients of 11-30 years do not show any evidence of having pregnancy, birth control pills, hormonal replacement therapy or any other cause as predisposing factors. Only 1 patient out of 7 show no any prevailing cause for deep vein thrombosis.

For the patients of age group 31-50 years the predisposing factor prevailing more is alcohol and smoking i.e. 19 patients and 18 patients respectively out of 24 patients of that age group. Followed by trauma, prolonged bed rest/hospitalization, surgery and birth control pills i.e. 5 patients, 4 patients, 4 patients and 1 patient respectively. The patients of 31-50 years do not show any evidence of having pregnancy, hormonal replacement therapy or any other cause as predisposing factors. Only 2 patients out of 24 show no any prevailing cause for deep vein thrombosis.

For the patients of age group 51-70 years the predisposing factor prevailing more is alcohol and smoking i.e. 8 patients and 8 patients respectively out of 11 patients of that age group. Followed by trauma, prolonged bed rest/hospitalization and surgery i.e. 3 patients, 4 patients and 4 patients respectively. The patients of 51-70 years do not show any evidence of having pregnancy, hormonal replacement therapy, birth control pills or any other cause as predisposing factors. Only 1 patient out of 11 show no any prevailing cause for deep vein thrombosis.

For the patients of age group 71-90 years the predisposing factor prevailing more is alcohol and smoking i.e. 6 patients and 6 patients respectively out of 8 patients of that age group. Followed by trauma, prolonged bed rest/hospitalization and surgery i.e. 3 patients, 2 patients and 4 patients respectively. The patients of 71-90 years do not show any evidence of having pregnancy, hormonal replacement therapy, birth control pills or any other cause as predisposing factors. No any patient out of 11 come under no cause category for deep vein thrombosis all of them have one or the other prevalent causes.

Correlation Between Age Group And Signs And Symptoms.

For the patients of age group 11-30 years the signs and symptoms prevailing maximum is swelling i.e. 7 patients out of 7 patients of that age group. Followed by difficulty in walking and pain i.e. 5 patients and 3 patients respectively. The patients of 11-30 years the sign prevailing minimum is warmth i.e. only 1 patient out of 7 patients of that age group.

For the patients of age group 31-50 years the signs and symptoms prevailing maximum is swelling i.e. 21 patients out of 24 patients of that age group. Followed by pain and difficulty in walking i.e. 14 patients and 10 patients respectively. The patients of 11-30 years the sign prevailing minimum is warmth i.e. only 7 patients out of 24 patients of that age group.

For the patients of age group 51-70 years the signs and symptoms prevailing maximum is swelling i.e. 10 patients out of 11 patients of that age group. Followed by pain and difficulty in walking i.e. 7 patients and 5 patients respectively. The patients of 51-70 years the sign prevailing minimum is warmth i.e. only 2 patients out of 11 patients of that age group.

For the patients of age group 71-90 years the signs and symptoms prevailing maximum is swelling i.e. 7 patients out of 8 patients of that age group. Followed by difficulty in pain and walking i.e. 5 patients and 3 patients respectively. The patients of 11-30 years the sign prevailing minimum is warmth i.e. only 1 patient out of 8 patients of that age group.

Correlation Between Age Group And Veins Involved In Dvt.

For the patients of age group 11-30 years the vein involved in deep vein thrombosis in maximum patients is common femoral vein i.e. 3 patients out of 7 patients of that age group. Followed by involvement of superficial femoral vein i.e. 2 patients. The patients of 11-30 years the veins not involved in any patients are popliteal vein, anterior tibial vein and posterior tibial vein.

For the patients of age group 31-50 years the vein involved in deep vein thrombosis in maximum patients is common femoral vein i.e. 9 patients out of 24 patients of that age group. Followed by involvement

of superficial femoral vein and popliteal vein i.e. 9 patients and 5 patients respectively. The veins involved in minimum patients are anterior tibial vein and posterior tibial vein i.e. 1 patient in each of them.

For the patients of age group 51-70 years the vein involved in deep vein thrombosis in maximum patients is superficial femoral vein i.e. 5 patients out of 6 patients of that age group. Followed by involvement of common femoral vein and popliteal vein i.e. 3 patients and 2 patients respectively. The veins involved in minimum patients are anterior tibial vein and posterior tibial vein i.e. 2 patients in each of them.

For the patients of age group 71-90 years the vein involved in deep vein thrombosis in maximum patients is superficial femoral vein i.e. 2 patients out of 8 patients of that age group. Followed by involvement of common femoral vein and popliteal vein i.e. 1 patient in each of them. Among the patients of 71-90 years the veins not involved in any patients are anterior tibial vein and posterior tibial vein.

Correlation Between Gender And Predisposing Factors.

Among male patients the predisposing factor prevailing more are smoking and alcohol i.e. 34 patients and 33 patients out of 39 male patients. Followed by trauma, prolonged bed rest/hospitalization and surgery i.e. 11 patients, 10 patients and 9 patients respectively. The male patients do not have pregnancy, birth control pills, hormonal replacement therapy or any other cause as predisposing factors. Only 2 patients out of 39 show no any prevailing cause for deep vein thrombosis.

Among female patients the predisposing factor prevailing more are surgery, trauma and prolonged bed rest/hospitalization i.e. 5 patients, 4 patients and 4 patients out of 11 female patients. Followed by alcohol, smoking and birth control pills i.e. 1 patient in each of the causes. The female patients do not show any evidence of pregnancy, hormonal replacement therapy or any other cause as predisposing factors. Only 2 patients out of 11 show no any prevailing cause for deep vein thrombosis.

Correlation Between Gender And Signs And Symptoms.

Among male patients the sign prevailing more is swelling i.e. 36 patients out of 39 male patients. Followed by pain and difficulty in walking i.e. 23 patients and 17 patients respectively. The sign present in minimum no. of patients is warmth i.e. 10 patients out of 39 patients. Among female patients the sign prevailing more is swelling i.e. 9 patients out of 11 female patients. Followed by pain and difficulty in walking i.e. 6 patients in each of them. The sign present in minimum no. of patients is warmth i.e. 1 patient out of 11 patient

Correlation Between Gender And Veins Involved In Dvt.

Among male patients the vein involved in deep vein thrombosis in maximum patients is common femoral vein i.e. 16 patients out of 39 male patients. Followed by involvement of superficial femoral vein and popliteal vein i.e. 14 patients and 5 patients respectively. The veins involved in minimum no. of male patient's ATV and PTV i.e. 3 out of 39 male patients.

Among female patients the vein involved in deep vein thrombosis in maximum patients is common femoral vein and superficial femoral vein i.e. 4 patients in each of them out of 11 female patients. Followed by involvement of popliteal vein i.e. 3 patients.

Summary

This study was done to assess the role of Colour Doppler sonography in diagnosis of lower limb deep vein thrombosis.

It aimed to evaluation of patients with suspected deep vein thrombosis by using colour Doppler ultrasonography.

To evaluate the spectrum of findings on colour duplex ultrasound in patients presented with clinical signs and symptoms of deep vein thrombosis.

To confirm the presence of thrombosis in clinically suspected patients of deep vein thrombosis.

In our study 50 patients with clinically suspicion of lower limb deep vein thrombosis were subjected for Doppler examination. Out of all the patients it was found that the maximum incidences of deep vein

thrombosis were noted in the age group of 31-50 yrs. i.e. 48%, and minimum incidence in the age group of 11-30 yrs. i.e. 14%. The age group of 51-70 yrs. had 22% of patients and that of 71-90 yrs. of age group had 16% of patients out of total patients in the study.

Out of all the patients it was found that majority of the patients were male 78% while incidence in female patients is 22%.

Out of 50 suspected patients of deep vein thrombosis 60% of them were found to be positive or presence of deep vein thrombosis and 40% of them had negative or absence of deep vein thrombosis.

Unilateral (96%) involvement was being found to be more common than bilateral. Deep vein thrombosis was more common in right extremity i.e. 50% then left extremity i.e. 46%. Only 4% of patients had bilateral involvement.

It was being found in the study that out of all the predisposing factors the maximum prevailing factor among the patients of deep vein thrombosis were smoking i.e. 70% of patients and alcohol i.e. 68%. Trauma and surgery have 30% and 28% of incidence as predisposing factors. Prolonged bed rest/ hospitalization have 28% of incidence.

Symptoms prompted for Doppler examination were swelling in 90%, pain in 58%, warmth in 22% and Difficulty in walking among 46% of patients. Thus swelling and pain were predominant symptoms. In cases showing evidence of deep vein thrombosis, the least common symptom was warmth.

The distribution in thrombi in present study was found as involvement of common femoral vein among 40% of patients, involvement of superficial femoral vein among 36% of patients, involvement of popliteal veins among 16% of patients and involvement of ATV and PTV among 6% of patients. Thus there is high incidence of thrombi in common femoral vein of lower extremity.

The correlation between the age group and predisposing factor was being observed and it was found that smoking and alcohol was prevailing factor more in the age group of 31-50 yrs. of age group i.e. 36% and 38% respectively. Trauma and surgery was prevailing more in age group of 31-50 yrs. of age i.e. 10% and 8% respectively. 4% of the patients had no any prevailing cause for deep vein thrombosis.

The correlation between age group and symptoms was been observed which resulted that pain is found in majority of patients of age group of 31-50 yrs. i.e. 28%, swelling among age group of 31-50 yrs. i.e. 42%, warmth among age group of 31-50 yrs. i.e. 14% and presence of difficulty in walking among age group of 31-50 yrs. i.e. 20%.

The correlation between age group and veins involved was observed which resulted that involvement of common femoral vein in majority of patients of age group of 31-50 yrs. i.e. 26%, superficial femoral vein among majority of patients age group of 31-50 yrs. i.e. 18%, popliteal vein among majority of age group of 31-50 yrs. of age group i.e. 20% and involvement of ATV and PTV among majority of patients of 51-70 yrs. of age group i.e. 4%.

The correlation between gender and predisposing factors was observed and it was found that among male the causes more prevailing was smoking and alcohol i.e. 34% and 33% respectively. Prolonged bed rest, trauma and surgery included 20%, 22% and 18% among male patients. For female patient's majority of them have shown prolonged bed rest, trauma and surgery as predisposing factor i.e. 8%, 8% and 10%.

The correlation between gender and signs and symptoms was observed and it was found that among male the symptom more prevailing swelling i.e. 72% of patients, pain among 46% of patients, difficulty in walking among 34% of patients and warmth among 20% of patients. Female had swelling among 18% of patients, pain among 12% of patients, difficulty in walking among 12% of patients and warmth among 2% of patients.

The correlation between gender and veins involved was been observed and it was found that among male the vein involved more was common femoral vein i.e. 32% of patients, SFV among 28% of patients, popliteal vein among 10% of patients and ATV and PTV among 6% of patients. Female have common femoral vein among 8% of patients,

superficial femoral vein among 8% of patients, popliteal vein among 6% of patients and there was no any involvement ATV and PTV among female patients.

CONCLUSION

Deep vein thrombosis of lower limbs can be detected reliably, non-invasively and rapidly by the use of colour doppler ultrasonography. Gray scale findings together with colour doppler helps in qualitative evaluation of the venous system of lower limbs. Duplex doppler ultrasonography can help in early detection of deep vein thrombosis in clinically suspected cases and help in prompt treatment of the patients as early and prompt treatment is crucial in the course of deep vein thrombosis. It is also helpful in evaluating the site, extent and stage of thrombus. Thus it can be concluded that keeping in mind the limitations and the advantages offered by the colour doppler ultrasonography, it is a good, reliable, inexpensive and rapid method of investigation for deep vein thrombosis of lower limbs.

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