SAS Journal of Surgery ISSN 2454-5104
SAS J. Surg., Volume-3; Issue-2 (Feb, 2017); p-61-70
Available online at http://sassociety.com/sasjs/

Original Research Article

Prospective Surveillance for Perioperative Deep Venous Thrombosis in Surgical Cases

Dr. Sai Krishna[2], Dr. Rita Singh[1], Dr. Mithun G[2]
[1]Assistant professor, MNR medical college and hospital, Sangareddy, Telangana
[2]Post graduate, MNR medical college ad hospital, Sangareddy, Telangana

***Corresponding author**
Dr. Mithun G
Email: mittu.gorre@gmail.com

Abstract: In the present study surveillance for the development of DVT in patients undergoing general surgery was carried out, to prospectively document the risk of development of DVT in general surgical procedures, and to identify subgroups of patients and surgeries, in which there is a higher risk of development of DVT, and correlate the same with other associated risk factors. Two hundred cases undergoing general surgical procedures under spinal or general anaesthesia, between February 2013 to July 2015, wherein the duration of surgery was more than an hour, were selected, after excluding those in whom DVT was detected preoperatively, and patients on anti-coagulant therapy. Serial calf and thigh circumference were measured at fixed levels for both limbs along with Duplex scan surveillance. The study group consisted of 102 males and 98 females. Post-operative DVT was detected on Duplex scan in 3 patients (1.5%). Two of these patients with DVT had clinically recognizable signs, and 2 of these 3 patients were males. The patients with previous history of DVT (one case) and those on oral contraceptives (six cases) did not develop DVT. Malignancy was present in 26 of the 200 patients in the study, and one of them developed DVT. Among the 3 patients who underwent splenectomy, one developed DVT. Among the 19 patients operated under SA, none developed DVT. Post-operative immobilization for >4 days occurred in 4 patients, and one of them developed DVT. The duration of surgery was >2 hrs in 109 of these patients, and all the 3 patients who developed DVT in the study belonged to this sub-group. Patients with prolonged immobilization following surgery, and Patients undergoing splenectomy are at a higher risk of developing DVT. There is no significant increase in risk of development of DVT in patients with a past history of DVT, and patients on oral contraceptives undergoing general surgical procedures. However, the sample in our study is too small to arrive at such specific conclusions. There is no significant increase in risk of development of DVT, in patients with malignancies undergoing general surgical procedures. The study has to be continued with greater number of cases to get statistically significant results. Clinical methods alone cannot be relied upon for the diagnosis of DVT.
Keywords: Deep vein thrombosis; Duplex scanning; Post-operative immobilization; Duration of surgery; Type of anaesthesia (GA / SA); Splenectomy.

INTRODUCTION

Patients who undergo surgical procedures are at a higher risk for developing deep vein thrombosis. The incidence of DVT and its sequelae are said to be quite high in western countries. This fear has induced many surgeons to put the patients who are undergoing surgeries on prophylactic anticoagulant therapy. However, it has been noticed that in our country the incidence of DVT is considered to be low, and most of the surgeons do not put their patients on prophylactic anticoagulant therapy before major surgeries. This is probably true in many south-east Asian countries also.

However, there is no significant study available to say that prevalence of DVT among the Indian population undergoing major surgeries is low. The purpose of this study is to prospectively document the risk of perioperative DVT complicating surgical procedures in our setup, and to compare the risk of DVT with respect to age, gender, the time taken by surgical procedure, and the intended surgical procedure

Incidence of perioperative deep vein thrombosis in surgical cases

A prospective study done by S.S.R. Murthy *et al;* [6] showed that overall incidence of deep vein thrombosis in Indians was 3.3% and it was 1.3% by clinical methods and 2.6% by ultrasound examination alone. In a prospective study done by Wr. Stinn *et al;* [14] it was shown that patients in whom a craniotomy was done had a significantly higher risk for developing DVT than those who underwent cervical or lumbar spinal surgical procedures. The incidence of DVT in Chinese patients who underwent elective craniotomy for brain tumours was low, and the use of routine

heparin as prophylaxis was not justified because of the increased risk of intracranial bleeding [15].

Several studies observed that the risk of postoperative DVT in patients undergoing infrainguinal revascularisation was low, and that postoperative anticoagulation was to be observed for specific indications [16]. P.O. Stein *et al;* concluded that the incidence of DVT in men aged 20 to 49 years was higher than in women of same age, while it was comparable among men and women = or > 50 years[17], in studies conducted on 34,567 patients.

From Malaysia, an incidence of 62.5% DVT in distal veins was reported which included proximal deep vein thrombosis in 12% cases, after specific major orthopaedic surgeries [2]. Several studies observed that incidence of proximal deep vein thrombosis were nearly 20% of total DVT incidence [12]. A study done by Ramji Narayan in South India showed that the incidence of deep vein thrombosis in patients during the post-operative period was 28%. ^{125}I-fibrinogen techniques were used for the study [18]. Burke *et al;* [19] arrived at the assumption that the diagnosis of lower limb DVT is frequently associated with lower limb amputation, in studies conducted in California, USA.

Study done by Ian E. Cunningham and NK Yong [20] showed that the incidence of DVT in Malaysian patients during the post-operative period was 12% which is much lower when compared to Western standards. CK Mok *et al;* [1] studied 53 Hong Kong Chinese patients with fractures of proximal femur, who underwent surgery. The incidence of DVT in the fractured limb was 53.1% and in the uninjured limb it was 14.3%.

METHODOLOGY

The cases included in the study were 200 cases undergoing surgical procedures during the period of February 2013 to July 2015 at MNR Hospital, Sangareddy, and Telangana.

Inclusion criteria

1. Age greater than 15 years
2. Surgery –

a. Under spinal, or general anaesthesia

b. Duration of surgery lasting more than 60 minutes.

3. Surgeries included can be broadly divided into five categories:
    i. Major abdominal surgeries for malignancies, like abdominoperineal resections, hemi colectomies, gastrostomies.
    ii. Abdominal surgeries for perforation of hollow viscera, like Ileal perforations, Du perforations, colonic perforations.
    iii. Surgeries for intraabdominal inflammatory pathology associated with intraabdominal adhesions, like laparoscopic cholecystectomies, appendicectomies.
    iv. Other abdominal surgeries, like vagotomy with GJ, lumbar sympathectomise, huge Para umbilical hernias, incisional hernias, mesh rectopexies, etc.
    v. Other surgeries like thyroidectomies modified radical mastectomies, amputations, surgeries for varicose veins etc.

Exclusion criteria

1. Patients who have DVT identified on preoperative venous Doppler are excluded from the study.
2. Patients on anticoagulant therapy will be excluded from the study.
3. Trauma patients undergoing surgery will be excluded from the study.

Instrument

Patients were shifted to ultrasound department, and using 8 to 12 MHz linear transducers, the examination was performed. For this study, GE ultrasound colour Doppler Scanner was used.

Patient position

The patient is normally examined in the supine position with the head of the bed elevated to permit pooling of blood in the leg veins. Footwear and stockings should be removed. The legs should rest in a comfortable position with the hips slightly externally rotated and the knees slightly flexed. For examination of the popliteal veins, the patient should assume the prone position with the feet elevated on a pillow. Lateral decubitus positions are also used in addition to the above said positions for the veins in the popliteal fossa. Patients undergoing surgery were screened one day prior to surgery, (on the day of surgery in patients undergoing surgery on emergency basis). Post-operatively on 2nd and 4th post-operative day venous flow pattern was studied. In some patients who underwent major abdominal surgeries, Doppler studies were done on 6th and 10th post-operative day.

Examination sequence

Posterior tibial vein:

Initial assessment of the posterior tibial venous flow signal behind the medial malleolus permits indirect assessment of the status of the calf veins. With a generous amount of acoustic gel on the Doppler probe, the posterior tibial arterial signal is initially identified, and a search is made for the low-pitched phasic venous signal. If the feet are cool and vaso constricted, manual compression may be required to elicit the posterior tibial venous signal. The calf is then manually

compressed and released to assess deep venous competence and the patency of the calf veins. Normally there should be no signal during calf compression and a prominent augmentation of venous flow on release of the calf. The amount of flow augmentation with this manoeuvre will be influenced by the degree of peripheral vasoconstriction but should be symmetric in the two limbs. Reduction in posterior tibial venous velocity augmentation in response to release of calf compression is the best indicator of major calf vein thrombosis.

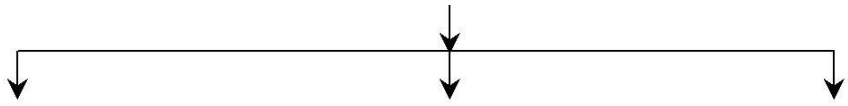
Common femoral vein:

Initially the common femoral pulse is palpated and a flow velocity signal elicited from this vessel. The common femoral vein lies medial to the artery, and the flow velocity signal is then obtained from this vessel. The influence of calf and thigh compression and a Valsalva manoeuvre (or abdominal compression) is noted.

Popliteal vein:

With the patient, prone, the popliteal artery signal is located, and the adjacent popliteal venous signal is elicited. The effect of respiration and proximal and distal limb compression manoeuvres are noted. It is important to realize that the venous evaluation in the extremities is an accurate indicator of the patency of the major intra-abdominal and intra-thoracic venous trunks. Thus the character of the common femoral venous velocity signals is an accurate guide to the status of the iliac veins and the inferior vena cava. External iliac, internal iliac, common iliac veins and inferior vena cava were routinely examined during the procedure. Examination of the superficial veins, particularly the long saphenous vein, is useful not only in screening for superficial thrombophlebitis and varicose veins but also to help confirm the diagnosis of deep venous obstruction. With the latter, the flow in the saphenous system may be increased compared to flow in the opposite extremity.

PROTOCOL



Pre-operative Intra-Operative Post-operative

Pre-operative

- Name, age, sex, address
- Risk factors: habitus, oestrogen therapy, oral contraceptive, diabetes mellitus, hyperlipidaemia, smoking, previous DVT. Any medical illness – Cardiovascular, respiratory.
- Diet
- Recent drug intake – Warfarin, aspirin.
- Traumatic shock
- General physical examination
- Evidence of hyperlipidaemia, peripheral vascular disease
- Cardiovascular system
- Respiratory system
- Investigations

1. Random blood sugar
2. Lipid profile
3. Chest x-ray
4. ECG
5. Blood group

Clinical evidence of Deep Vein Thrombosis

1. Colour changes in the limb.
2. Swelling of the limb – especially leg and ankle.
3. Prominence of superficial veins
4. Presence of varicose veins
5. Local warmth of the limb
6. Thigh or calf tenderness
7. Homan's sign
8. Mosse's test
9. Limb girth – at 3 constant sites
    a. Thigh – 5" above the upper margin of patella
    b. Calf – 5" below apex of patella
    c. Ankle – 2" proximal to tip of medial malleolus.

Intra-operative

- Date of operation
- Indication for surgery and type of surgery
- Anaesthesia
- Type of anaesthesia - GA/SA
- Duration of surgery: Position time, surgery time
- Estimated blood loss
- Tourniquet if applied – Duration
- Intra-operative vessel injury – Artery / vein
- Any anaesthetic complications

Post-operatively

- Date of mobilization
- Any clinical features of DVT
- Doppler studies on 2nd and 4th post-operative day (6th and 10th post-operative day in some major abdominal surgeries).
- Normal Doubtful Definitive
    1. Femoral veins

2. Popliteal veins
3. Anterior and posterior tibial veins

RESULTS

Statistical methods applied

Following statistical methods were employed in the present study Contingency Table analysis and Chi-square test

Contingency Table analysis

The contingency table analysis procedure (Cross tabs) forms two-way and multiway tables and provides a variety of tests and measures of association for two-way tables. The structure of the table and whether categories are ordered determine what test or measure to use. Crosstabs' statistics and measures of association are computed for two-way tables only. If you specify a row, a column, and a layer factor (control variable), the Crosstabs procedure forms one panel of associated statistics and measures for each value of the layer factor (or a combination of values for two or more control variables). For example, if GENDER is a layer factor for a table of MARRIED (yes, no) against LIFE (is life exciting, routine, or dull), the results for a two-way table for the females are computed separately from those for the males and printed as panels following one another.

Chi-square test

The Chi-Square Test procedure tabulates a variable into categories and computes a chi-square statistic. This goodness-of-fit test compares the observed and expected frequencies in each category to test either that all categories contain the same proportion of values or that each category contains a user-specified proportion of values. All the statistical calculations were performed using the software SPSS for Windows (Statistical Presentation System Software, SPSS Inc, 1999, New York) version 10.0.

Table 1: Age groups of patients and gender of the same, undergoing the surgery

Age groups		Sex		Total
		Male	Female	
Below 40	Frequency	33	36	69
	Percentage	32.4	36.7	34.5
40-60	Frequency	51	47	98
	Percentage	50.0	48.0	49.0
Above 60	Frequency	18	15	33
	Percentage	17.6	15.3	16.5
Total	Frequency	102	98	200
	Percentage	100.0	100.0	100.0

CC=0.049; P<0.784: **Chi-square for age only =31.810; P<0.000 (HS)**

No significant association between age groups and sex (CC=0.049; P<0.784)

When age groups considered alone, a significant chi-square value was observed χ^2=31.80; P<0.000), revealing that most of the patients belonged to the age group of 40-60 years in our study.

Table 2: Category of the surgery and gender of the patients undergoing the same

Category of surgery		Sex		Total
		Male	Female	
Category I	Frequency	15	10	25
	Percentage	14.7	10.2	12.5
Category II	Frequency	23	18	41
	Percentage	22.5	18.4	20.5
Category III	Frequency	35	44	79
	Percentage	34.3	44.9	39.5
Category IV	Frequency	15	13	28
	Percentage	14.7	13.3	14.0
Category V	Frequency	14	13	27
	Percentage	13.7	13.3	13.5
Total	Frequency	102	98	200
	Percentage	100.0	100.0	100.0

CC=0.116; P<0.603: **Chi-square for age only =51.5; P<0.000 (HS)**

No significant association between surgery categories and gender (CC=0.116; P<0.603). However, when surgeries alone were considered, significantly more number of surgeries were performed in Category III and least in Category I, which is further confirmed by a significant chi-square value (χ^2=51.5; P<0.000).

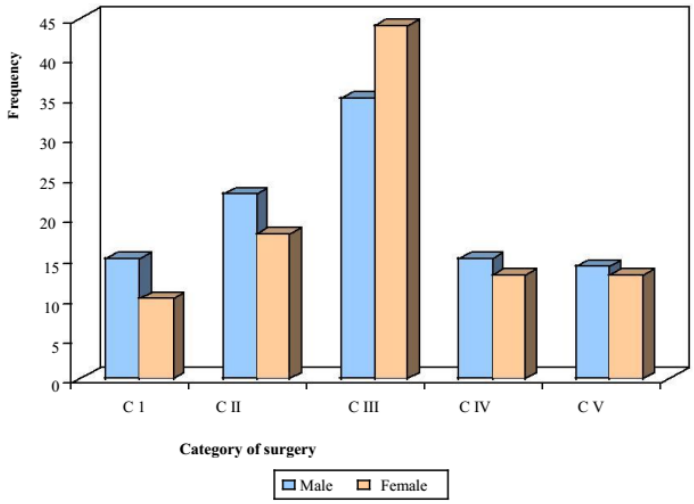


Fig 1: Category of the surgery and gender of the patients undergoing the same

Table 3: Accuracy of Diagnosis

DVT	Clinical	Doppler
Percentage	66.7	100

Clinical signs and symptoms were positive in only two of the three cases that developed DVT, which was detected by Doppler studies in all the three cases. This states that the accuracy of clinical methods in diagnosing DVT is 66.7%, and hence clinical symptoms and signs alone cannot be relied upon, for the detection of DVT.

Table 4: Site of thrombus and occlusion

Case	Femoral	Popliteal
1	+	+
2	-	+
3	+	+

Among the three patients who developed thrombosis, popliteal vein was occluded by thrombosis in all the three cases, while femoral vein was occluded in two of the three cases.

Table 5: Category of surgeries in which DVT was detected

Category of surgery		No DVT	DVT	Total
Category I	Frequency	24	1	25
	Percentage	96.0	4.0	100.0
Category II	Frequency	41	-	41
	Percentage	100.0	-	100.0
Category III	Frequency	79	-	79
	Percentage	100.0	-	100.0
Category IV	Frequency	26	2	28
	Percentage	92.9	7.1	100.0
Category V	Frequency	27	-	27
	Percentage	100.0	-	100.0
Total	Frequency	197	3	200
	Percentage	98.5	1.5	100.0

CC=0.211; P<0.050 (S)

DVT was found only in category I, category IV and in the rest of the categories of surgeries, the patients did not develop DVT (CC=0.211; P<0.050). However, the sample in the study is small to arrive at specific conclusions.

Table 6: DVT with respect to duration of surgery (all >1hr)

Duration >than or <than 2hrs		**No DVT**	**DVT**	**Total**
< 2 hrs	Frequency	91	-	91
	Percentage	100.0	-	100.0
>2 hrs	Frequency	106	3	109
	Percentage	97.2	2.8	100.0
Total	Frequency	197	3	200
	Percentage	98.5	1.5	100.0

CC=0.112; P<0.111 (NS)

In our study, all the patients undergoing surgery were further classified based on the duration of surgery lasting for more than 2 hours or less (none less than an hour). Among 91 patients in whom the duration of surgery was less than 2 hours, none developed DVT, while among the 109 patients in whom the duration of surgery lasted more than 2 hours, three developed DVT.

There was no significant association (CC=0.112; P<0.111) observed between the duration of surgery and DVT.

Table 7: DVT with respect to duration of postoperative immobilization

>4, or < 4 days' post op.		**No DVT**	**DVT**	**Total**
< 4 days	Frequency	194	2	196
	Percentage	99.0	1.0	100.0
> 4 days	Frequency	3	1	4
	Percentage	75.0	25.0	100.0
Total	Frequency	197	3	200
	Percentage	98.5	1.5	100.0

CC=0.266; P<0.000 (HS)

Among the 4 patients who were immobilized for more than 4 days following surgery, one developed DVT, while 2 of the patients among 196 who were immobilized for less than 4 days, developed DVT. Significant association (CC=0.266; P<0.000) observed between the duration of post op immobilization (>4 days) and development of DVT.

Table 8: Associated Medical conditions in the patients

Associated Medical conditions		**No DVT**	**DVT**	**Total**
No	Frequency	154	1	155
	Percentage	99.4	0.6	100.0
Yes	Frequency	43	2	45
	Percentage	95.6	4.4	100.0
Total	Frequency	197	3	200
	Percentage	98.5	1.5	100.0

CC=0.129; P<0.065

22.5% of the patients in our study had associated medical conditions, which included IHD, DM, HTN, Bronchial Asthma, and Obesity. There is no significant association (CC=0.129; P<0.065) noted between associated medical conditions and the development of DVT in our studies.

Table 9: Associated medical conditions in the patients

	Total	**DVT**	**Associated medical conditions**	**Presence of associated medical conditions with DVT**	
				Yes	**No**
Frequency	200	3	45	2	43
Percent	100.0	1.5	22.5		

Table 10: DVT in patients undergoing splenectomy

Undergoing splenectomy		No DVT	DVT	Total
No	Frequency	195	2	197
	Percentage	99.0	1.0	100.0
Yes	Frequency	2	1	3
	Percentage	66.7	33.3	100.0
Total	Frequency	197	3	200
	Percentage	98.5	1.5	100.0

CC=0.308; P<0.000 (HS)

Among the three patients who underwent splenectomy in our studies, one developed DVT. There is significant association (CC=0.308; P<0.000) observed between splenectomy and the development of DVT in our studies.

Table 11: DVT in patients with Malignancy

Surgery in a Malignant patient		No DVT	DVT	Total
No	Frequency	172	2	174
	Percentage	98.9	1.1	100.0
Yes	Frequency	25	1	26
	Percentage	96.2	3.8	100.0
Total	Frequency	197	3	200
	Percentage	98.5	1.5	100.0

CC=0.074; P<0.291 (NS)

Twenty-six patients undergoing surgery had malignancy, and one of them developed DVT post operatively. There was no significant association (CC=0.074; P<0.291) between malignancy and the development of DVT in our studies.

Table 12: Details of deep vein thrombosis in the 3 cases

Case No.	Age (yrs)	Sex	Onset (post-operative day)	Affected limb
1	46	F	$_{2}$nd	Right
2	21	M	$_{6}$th	Left side
3	65	M	$_{2}$nd	Left side

Case 1:

46 years old female was admitted with a huge Para umbilical hernia. She was a known case of IHD, diabetes mellitus, hypertension and bronchial asthma, and was obese, weighing 115 kgs. Under general anaesthesia, mesh-hernioplasty was done. Total time for surgery was 3 hrs and on 2nd postoperative day there was increase in girth of right thigh by 1 cms. She had calf tenderness and pain on dorsiflexion of foot. On studying the venous flow pattern, augmentation of venous signal was poor. Doppler ultrasound was done which confirmed the diagnosis of thrombus in the femoral and popliteal veins, on the right side.

Case 2:

21 years old male, was admitted with haemorrhagic shock following road traffic accident, laparotomy done revealed hemoperitoneum secondary to splenic laceration, with gastric perforation. Patient underwent splenectomy, thorough peritoneal lavage, closure of gastric perforation and feeding jejunostomy under general anaesthesia, the total duration of surgery was 3 hrs and 45 minutes. Patient was on ventilator support for 5 days following the surgery, there was no oedema, and the limb girth measurements were normal. But patient experienced pain on dorsiflexion of the Left foot. Doppler ultrasound done on the 6th postoperative day revealed the diagnosis of a thrombus in the left popliteal vein.

Case 3:

65 years old male, was admitted with symptoms and signs suggestive of Gastric outlet obstruction. Endoscopy revealed growth in the pyloric end of stomach. He was a known case of Type II diabetes mellitus and hypertension on medication, and a chronic smoker. Patient underwent palliative GJ with jejuno-jejunostomy, under general anaesthesia, surgery lasting for 3 hrs and 20 minutes. Post operatively on the 2nd day patient had oedema of left leg, and pain in the

calf on compression and dorsiflexion of foot. There was no venous signal detected on Doppler. Doppler ultrasound done confirmed the presence of thrombosis both in the left femoral and popliteal veins.

DISCUSSION

Incidence

In general, in most of the studies on the incidence of deep vein thrombosis, incidence is said to be high in the Western countries, though very few studies have been done on patients undergoing general surgical procedures. Flinn *et al.;* [14] in their studies on patients undergoing neurosurgical procedures found an incidence rate of 5.6%, while an incidence rate of 4% was detected in Chinese patients undergoing elective craniotomy by Ting *et al.;* [15]. In their studies on patients undergoing infrainguinal revascularisation, Passman *et al.;* [16] detected an incidence rate of 2.8%.

Few studies from Asia have shown a varying degree of incidence of deep vein thrombosis. In Studies done on patients undergoing abdominal surgeries [20, 22, 7]. The incidence of deep vein thrombosis was found to be ranging from 2.6% to 15.3%. Another study of patients undergoing gynaecological surgery showed an incidence of 2.4%[23]. Four other studies done on patients undergoing orthopaedic surgery for proximal femoral fracture or total hip replacement reported the incidences of deep vein thrombosis to be 53.3% (Hong Kong)[21], 4% (Thailand)[23] 10% (Korea)[23] and 9.7% (Singapore)[20]. In the study by Dhillon *et al.;* [2] in Malaysia, incidence of deep vein thrombosis in patients who underwent surgery for fracture of proximal femur or for total hip replacement or total knee replacement was 62.5%.

All the above-mentioned studies focus our attention to the fact that incidence of deep vein thrombosis is raised in different studies among the Asian groups. Though some groups claim a very high incidence, others have showed that the incidence of deep vein thrombosis is low in the Asian and African community [1]. A prospective study done by SSR Murthy *et al.;* [6] showed that overall incidence of deep vein thrombosis in Indians was 3.3%, it was 1.3% by Clinical methods and 2.6% by ultrasound examination alone [6]. Hence, a study was designed in order to find out the incidence of deep vein thrombosis in patients undergoing major general surgeries without prophylactic anticoagulant therapy.

Diagnosing DVT

The methodology adopted for detection of deep vein thrombosis was different by various authors. David Warwick [11] in one of the largest studies showed that incidence of DVT in 1162 cases was found to be 10.6%. He used Doppler ultrasound to detect deep vein thrombosis. In the Asian countries, researchers have used different methods for detection of deep vein thrombosis. Few studies done in Asia used ^{125}I labelled fibrinogen to detect deep vein thrombosis [20, 22, 23].

SSR Murthy *et al.;* [6] in their study in North India used ultrasound for detection of deep vein thrombosis in patients undergoing abdominal surgery (2.6% - incidence). A study done by ON Nagi *et al.;* [24] in North India analysed the patients using compression ultrasound techniques. A study done by Ramji Narayan in South India used ^{125}I fibrinogen techniques for detection of deep vein thrombosis. According to Eugene F Bernstein [13], Doppler is 96% specific and 94% sensitive in detection of deep vein thrombosis. Although, venography was considered as the gold standard for the detection of deep vein thrombosis, Doppler ultrasound is equally sensitive and specific for the diagnosis of deep vein thrombosis. In our study duplex scanning was done for the detection of DVT.

Risk Factors

Strandness [3] did not find any relation between advancing age and the incidence of deep vein thrombosis, and had no relation to the previous attacks of deep vein thrombosis. In our study, there was one patient who had previous history of deep vein thrombosis but her postoperative period was uneventful after undergoing lap cholecystectomy, although we have not used any anticoagulants prophylactically. There is no significant association between the age of the patient and the incidence of DVT in our study. Per Coon [11], the incidence and prevalence for DVT were much higher in females, but in our study, there is no significant association between sex of the patient and DVT perioperatively.

A study by Sripad *et al.;* [25] showed that prolonged preoperative stay (>20 days) and post-operative immobilization increased the risk of deep vein thrombosis. In our study four persons were immobilized for more than 4 days following surgery and one of them had deep vein thrombosis. Kakkar *et al.;* [10, 4] in a retrospective review on gynaec cases, found 68.4% prevalence of leg vein thrombi in post op patients with a previous history of thromboembolism. In our study, there is no significant association between DVT and past history of DVT, in general surgical cases. However, the number of cases with a previous history of DVT in our study, is too small (three cases), to arrive at definite conclusions.

Risk factors such as habitus, oestrogen therapy, oral contraceptives, diabetes mellitus, hyperlipidaemia, and smoking did not seem to influence the incidence of DVT in our study, the most important risk factor was splenectomy and prolonged post-operative immobilization. In our study, one out of the three patients who underwent splenectomy developed DVT. Coon [11] in his study showed that risk of pulmonary embolism increased by two to three-folds in all patients with malignancies. Apart from carcinoma of pancreas the malignancies associated with high risk of

deep vein thrombosis are genito-urinary neoplasms, stomach, lung, and colon and breast neoplasms [17]. In our study one out of the three patients who had deep vein thrombosis had malignancy (case-3: Carcinoma stomach), and there was no significant association between the incidence of DVT in association with malignancies. There is no significant increase in the incidence of DVT, in patients on oral contraceptives undergoing general surgical procedures in our study. However, the sample is too small (six cases) to arrive at definite conclusions. Among the 19 patients who were operated under spinal anaesthesia none developed DVT. The study should be continued with more number of cases being operated under spinal anaesthesia, if any significance to the result is to be arrived at.

Onset of DVT

Literature regarding the onset of postoperative deep vein thrombosis show conflicting reports. Kakkar et al.[9,4] reported deep vein thrombosis to have occurred during the operation or in the immediate postoperative period (24 to 48 hrs) in the Western countries. Study done by KS Dhillon *et al.;* [2] from Malaysia showed that deep vein thrombosis was seen in patients within 5 days of surgery. In our study, the diagnosis of deep vein thrombosis in the postoperative period was made between 2nd and 6th postoperative day in all three cases.

Incidence of DVT in our series

We have studied two hundred patients. Totally three patients had deep vein thrombosis. Two had clinical features of deep vein thrombosis but one patient did not have classical clinical features of deep vein thrombosis. All the three cases were confirmed by Doppler ultrasound. The overall incidence of deep vein thrombosis in the postoperative period for patients undergoing general surgery was found to be 1.5% in our study, and clinical symptoms and signs were not accurate for diagnosing DVT (accuracy of 66.7%). Hence, in our opinion, the incidence of deep vein thrombosis is not all that high as projected in world literature. We do admit that the study was done in a single centre at a corner of India, where most of the patients come from a radius of around 100 kms.

CONCLUSION

1. The Incidence of DVT in patients undergoing general surgery in our studies is low (1.5%).
2. Patients with prolonged immobilization following surgery have greater propensity to develop deep vein thrombosis in the lower limbs.
3. Patients undergoing splenectomy are at a higher risk of developing DVT. However, the study has to be continued with increased number of cases under going splenectomy, to decide whether routine prophylaxis with anti-coagulant is necessary, in patients undergoing splenectomy.
4. There is no significant increase in risk of development of DVT in patients with a past history of DVT undergoing general surgical procedures. However, the sample in our study is too small to arrive at such specific conclusions.
5. There is no significant increase in risk of development of DVT, in patients with malignancies undergoing general surgical procedures.
6. There is no significant increase in risk of development of DVT, in patients on oral contraceptives undergoing general surgical procedures. However, the sample in our study is too small to arrive at such specific conclusions.
7. Clinical methods alone cannot be relied upon for the diagnosis of DVT.
8. The study has to be continued with greater number of cases to get statistically significant results.

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