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Research Article

Clinical and Etiological Profile of Patients with Splanchnic Venous Thrombosis in a Tertiary Care Centre from Southern India

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Abstract

Background: Splanchnic vein thrombosis (SVT) is an uncommon, but potentially life-threatening disease. An etiologic factor can be identified in about 25 - 75% of patients as reported in western literature. This study was done to evaluate thrombotic factors including JAK2V617F mutation in patients with SVT.

Aim: To evaluate clinical and etiological profile of patients with splanchnic venous thrombosis.

Methods: All patients with SVT diagnosed with CECT abdomen attending our institute from April 2011 to May 2013 were screened. Patients with malignancy, intra-abdominal inflammatory conditions or surgery in the preceding three months were excluded. A thrombophilia work-up (protein C, S and AT-III deficiency, APCR, ACLA and LA, homocysteine level and JAK2V617F mutation) was done.

Result: Total 39 patients were included (mean age: 45.9 ± 15.2 years; M:F 1.6:1). 29 patients (74.3%) had portal vein thrombosis (PVT), 6 (15.4%) had BCS and 4 (7.6%) had isolated mesenteric vein thrombosis. Isolated PVT was found in 8/29 (27.5%). 21/29 (72.5%) had additional one or more accessory vein involved. Site of thrombosis in BCS patients was in HV (50%), HV and IVC (33.3%) and HV and PV (16.7%). The common symptoms were abdominal pain (48%), ascites (38.5%), pedal edema (30%), splenomegaly (25.6%) and gastrointestinal bleeding (15%). 23% (9/39) patients were asymptomatic. Cirrhosis was found in 10/29 (34.4%) patients in PVT group. 50% patients had one thrombotic factor, 30% had two or more factors and 20% had none. JAK2V617F mutation was found in 5/39 (12.8%) patients. None of the cirrhotic patients had JAK2V617F mutation.

Conclusion: Splanchnic vein thrombosis usually presents as a chronic disease. A prothrombotic state was detected in 80% of patients. JAK2V617F mutation was detected in 12.8% patients

Keywords: Splanchnic Venous Thrombosis (SVT); Tertiary Care Centre; Thrombophilia

Background

Splanchnic vein thrombosis (SVT) is an uncommon, but potentially life-threatening disease [1]. It can affect the mesenteric veins, the portal vein or the supra-hepatic veins. Involvement of two or more different abdominal vein segments is not uncommon [2].

Presence of systemic symptoms is variable [3,4]. SVT is often asymptomatic and the clinical presentation can be varying. Advances in imaging techniques have facilitated the early diagnosis of SVT and it has resulted in decrease mortality rates in patients with SVT [6,7].

In almost seventy percent of patients with SVT, an aetiology can be identified [3,8-10]. The common causes were prothrombotic states (inheritable and/or acquired), malignancy, local factors (pancreatitis, abscess, inflammatory bowel disease, diverticulitis), surgery, trauma and cirrhosis. The association between Philadelphia negative myeloproliferative disorders and SVT, in particular between portal vein thrombosis and Budd Chiari syndrome is found in more than thirty percent of patients in most recent studies [11,12]. The identification of markers of Philadelphia negative myeloproliferative disorders such as JAK2 mutation is now recommended by most of the workers in the field of SVT [13]. The recent ACCP guidelines 2012 for DVT/PE recommends for testing for thrombophilia and myeloproliferative markers. This guideline strongly recommends continuing lifelong anticoagulation in those who have a thrombophilic or a myeloproliferative factor and who lack acute reversible cause of thrombophilia. There are no specific guidelines for SVT but same principle applies to this group also. However, some experts have expressed their concern about the specificity of these markers and the role of anticoagulation in cirrhosis with PVT or MVT as there are no large randomized control trials.

Studies from India on etiological workup of SVT without any local risk factors are few, retrospective and with small sample size.

Most of them did not study the inherited and acquired thrombotic risk factors like Philadelphia negative myeloproliferative disorder markers (JAK2V617F mutation) together.

Aim of the Study

- To study clinical profile of patients with splanchnic venous thrombosis.
- To study the frequency and the association of inherited and acquired thrombophilic factors in patients with splanchnic venous thrombosis.

Materials and Methods

Inclusion criteria: Patients diagnosed to have splanchnic venous thrombosis and worked up for thrombophilia who presented to the Department of Gastroenterology and Hepatology, Surgical Gastroenterology and to the Department of Haematology, Apollo Hospitals, Chennai, a tertiary care centre in south India, were included in the study over a period of two years from April 2011 to May 2013.

Exclusion criteria: All patients with

1. Malignancy
2. Intra-abdominal inflammatory conditions (e.g. pancreatitis inflammatory bowel disease)
3. Systemic inflammatory disease (e.g. Rheumatoid arthritis, Behcets disease)
4. Recent surgery within last three months
5. Those that were not completely evaluated for thrombophilia due to financial constraints.

The data collected were:

History:

1. Basic demographic data including age and gender.
2. Clinical characteristics at presentation.
3. Presence of risk factors for thrombosis (past history of umbilical sepsis, thrombosis, history of cancer, intra-abdominal inflammatory conditions, hematologic disorders, surgery within last three months).
4. History of other comorbidities (diabetes mellitus, hypertension, coronary artery disease, smoking).
5. Family history of venous thromboembolism.

Thrombosis was considered as acute in patients presenting within 60 days from the onset of symptoms [18,19]. The diagnosis of cirrhosis was based on clinical presentation, lab investigations, radiological tests and endoscopic findings.

Extra hepatic portal venous obstruction was diagnosed if a partial or complete thrombotic obstruction of the extrahepatic portal vein was found by appropriate radiological abdominal imaging.

Budd Chiari Syndrome was defined as any obstruction of the hepatic venous outflow at any region from the small hepatic veins to the junction of the inferior vena cava and the right atrium. Hepatic veno-occlusive disease (sinusoidal obstruction syndrome) or cardiac disorders associated with right heart failure were excluded [20].

Radiological investigations

The results of doppler ultrasonography, computed tomography and magnetic resonance imaging were noted.

Lab investigations

The blood tests performed at the time of diagnosis included complete blood count, erythrocyte sedimentation rate, peripheral smear, liver function tests, prothrombin time, blood urea, serum creatinine, serum electrolytes, serum HBsAg, HIV, anti HCV and anti-nuclear antibodies.

Rotterdam prognostic scores for BCS were calculated by equation: (1.27 x encephalopathy) + (1.04 x ascites) + (0.72 x PT) + (0.004 x bilirubin) [21]. Encephalopathy and ascites were scored as present (1) or absent (0), PT was scored as lower (0) or higher (1) than an INR of 2.3 and bilirubin (mmol/L) was included on a continuous scale. Patients were categorized according to their scores into Class I (< 1.1), class II (1.1 - 1.5) and class III (> 1.5). Child-Pugh scores and MELD score were assessed in BCS (irrespective of the presence of cirrhosis) and in cirrhosis with PVT patients to allow for a comparison with other published cohorts.

Thrombophilia work up

Protein C and S were measured on STAGO COMPACT (Diagnostic Stago Inc. USA) by functional clotting method using a commercially available STA Clot Protein C and S Kit respectively (Diagnostica STAGO S.A.S). The laboratory reference range was 70% - 130% for protein C and 65%-140% for protein S.

The chromogenic antithrombin assays based on the inhibition of human factor Xa was used to measure Anti thrombin III on STAGO COMPACT (Diagnostic Stago Inc. USA).

Activated protein C resistance was tested using commercially available Pro C Global reagent Kit (Siemens Healthcare, USA) on SYSMEX CA1500 (Siemens Healthcare, USA).

Lupus anticoagulant was tested on STAGO COMPACT (Diagnostic Stago Inc. USA) using DRVV 'S' (dilute Russell Viper Venom screen).

Anti-cardiolipin antibodies (IgM and IgG) were measured using ELISA (enzyme-linked immunosorbent assay).

Homocysteine was measured using chemoimmunolence method (ADVIA CENTAUR, SIEMENS, USA) on an overnight fasting EDTA sample.

Presence of marker of Philadelphia negative myeloproliferative disorders, i.e. genotyping of the JAK2V617F variant was performed by Real Time PCR. Each reaction was based on 25 ng genomic DNA isolated from whole blood (EDTA samples) and was run in a final volume of 20 µL.

Statistical analysis

Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS, version 11.0 for Windows, Chicago, IL). All the continuous variables were checked for the normality by using Shapiro Wilk test. All the continuous variables which were distributed normally were expressed as mean ± SD. Median and Inter Quartile Range (I.Q.R.) were calculated for variables which were not normally distributed. All the categorical variables were expressed either as percentage or proportions. Those continuous variables which were normally distributed were tested by ANOVA. Variables not following normal distributions were tested by either Mann Whitney U test (or) by Kruskal Wallis test based on the number of variables.

Comparison of categorical variables was done by χ^2 test or Fisher's exact test based on the number of observation. Wherever the number was lower than five, Fisher's exact test was used. All statistical tests were two sided. Statistical significance was set at a p value of 0.05 or less.

Results

Baseline characteristics

Out of these 39 patients, 71.8% were from south India, including Tamilnadu and Andhra Pradesh, 23.1% were from North-Eastern states and 5.1% were from overseas.24 (61.6%) patients were male and 15 (38.6%) patients were female. Sixteen (41%) patients were in 5th and 6th decade of life with mean age 45.9 ± 15.2 years (range: 19 to 82 years).

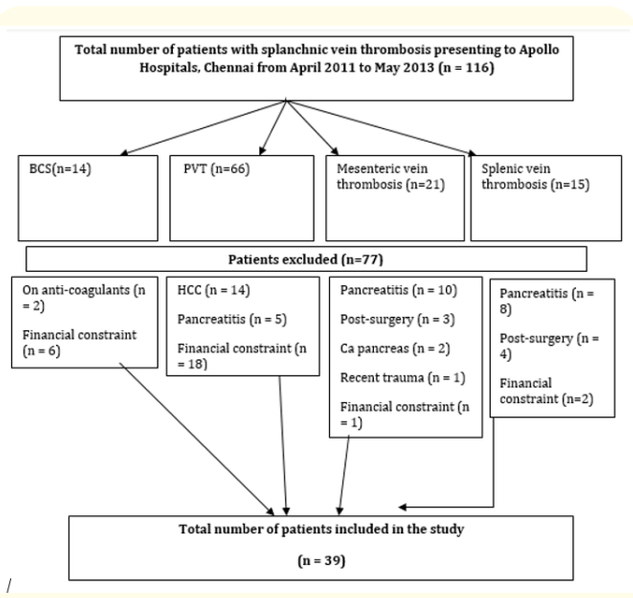

Figure 1: Total number of patients included.

Lab parameters	Total (n = 39)
Hb (gm%)	11.1 ± 2.9
PCV (%)	35.1 ± 7
Platelet (million/cu mm)*	0.23 (0.13 - 0.33)
Total WBC/cu mm*	7650 (5550 - 9850)
ANC/cu mm*	4996 (3928 - 6821)
Bilirubin (mg/dl)*	1 (1 - 1.7)
Protein (gm/dl)	7.0 ± 0.8
Albumin (gm/dl)	3.5 ± 0.6
INR*	1.2 (1 - 1.8)
Collaterals on CT scan	23 (59%)
BCS	2 (5%)
Cirrhosis	6 (15%)
EHPVO	15 (38.4%)
Endoscopy (36/39)	
EV	19 (48.7%)
PHG	4 (10.3%)
Fundal varix	2 (5%)
Normal	9 (23%)

Table 1: Baseline characteristics.

Clinical profile

6patients (15.4%) had BCS, 29 (74.3%) had PVT and 4 had mesenteric vein thrombosis. Among the patients with PVT, 10 (34.5%) had cirrhosis and 19 (65.5%) had EHPVO. 28% (11/39) patients had acute thrombosis who presented within 12 weeks of onset of symptoms: (1) 6 patients had PVT with cirrhosis. (2) 2 had BCS who presented with recent onset of pain. (3) 2 were non cirrhotic patients who had acute PV and SV thrombosis. (4) One patient had acute superior mesenteric vein thrombosis and he underwent surgery without a prior CT scan.

Six patients had acute abdominal pain with underlying chronic thrombosis (i.e. collaterals, portal cavernoma, and diagnosed case of chronic thrombosis).

Twenty percent (8/39) of the patient had no identifiable thrombotic factor, 49.8% (19/39) had one thrombotic factor and 30% (12/39) had two or more thrombotic factors.

The measurement of protein C (PC), protein S (PS) and antithrombin III (AT-III) showed reduction in 5% (2/39), 10.2% (4/39) and 5% (2/39) respectively. There were 35.9% (14/39) patients who had reduced PC, PS or AT-III in various combinations and this was not considered as thrombotic risk factors. APCR was observed in 15.3% (6/39) patients and high homocysteine was noted in 33% (13/39) patients. Presence of antiphospholipid antibodies was seen in 36% patients {LA in 10.2% (4/39) and ACLA in 36% (14/39) patients; 3 patients with ACLA also had LA}. JAK2 gene mutation was noted in 12.8% (5/39) patients.

Twenty percent (8/39) of patients had isolated deficiency of protein C (PC), protein S (PS) or AT-III. Fourteen (35.9%) patients had reduced PC, PS or AT-III in various combination out of which five patients had cirrhosis. Seventeen (43.5%) had normal PC, PS or AT-III out of which two had cirrhosis.

In PVT group, deficiency in protein C, protein S and antithrombin III was seen in 6.8% (2/29), 17.7% (4/29) and 6.8% (2/29) respectively. Anticardiolipin antibodies (IgM and/or IgG) were detected in 38% (11/29). High homocysteine was found in, 37.9% (11/29) patients. Activated protein C resistance was detected in three (10.3%) patients. JAK2V617F mutation was present in 10.3% (3/29) patients.

In BCS group, 2 patients (33%) had JAK2V617F gene mutation. One of the patient with JAK2 mutation also showed presence of lupus anticoagulant. Three (50%) patients were detected to have ACLA and one (16%) was positive for LA. Two (33%) patients were positive for APCR. None of the patients had isolated deficiency of protein C, protein S or AT-III. Two (33%) patients had high homocysteine levels. The lady with only high homocysteine also had history of recent oral contraceptive use.

In MVT group, one patient had high homocysteine and one had ACLA and LA positive.

Five patients (12.8%) had JAK2V617F mutation positive. Two of this patient with JAK2V617F mutation also had APLA. JAK2V617F mutation was more common in patients BCS compare to that of PVT. None of the cirrhotic patient had JAK2V617F mutation.

Discussion

Risk factors identified in the present study were past history of VTE in 5% (2/39), OCP use in 2.5% (1/39) and cirrhosis in 28% (11/39). Edyta., *et al*. [30] reported past history of VTE in 17% patients, OCP use in 3% and cirrhosis in 24% patients.

Risk factor	Total (n = 39)
Oral contraceptive use	1 (2.5%)
Previous history of vascular thrombosis	2 (5%)
Recurrent pregnancy loss	1 (2.5%)
Splenectomy	2 (5%)
Cirrhosis	11 (28%)

Table 2: Risk factors for thrombosis.

Site of thrombosis

In present study, PVT was found in 74.3% patients, mesenteric venous thrombosis in 7.6% and BCS in 15.4%. Isolated PVT was found in 20.5% patients, multiple site thrombosis in 38.4%. Among these, 23% patients had acute thrombosis. Mallikarjun., *et al.* [29] in their study reported isolated PVT in 39.5% patients, multiple site thrombosis in 38.4%, mesenteric vein thrombosis in 9% and BCS in 5.4% with 17% of patients having acute presentation.

Clinical features

The common symptoms were abdominal pain (48%), ascites (38.5%), jaundice (25.6%) and gastrointestinal bleeding (15%). 20% patients were asymptomatic. Esophageal varices were found in 48.7% patients. In a study by Mallikarjun., *et al.* [29], abdominal pain was noted in 64% patients, ascites in 71%, jaundice in 16% and gastrointestinal bleeding in 11% with less than one third being asymptomatic. Esophageal Varices were reported in 27% patient in the same study. Thus the clinical findings in present study were comparable with that reported in literature.

Thrombotic risk factors

A thrombotic risk factor was found in 80% of patients. Edyta., *et al.* [30] found positive risk factor was seen in 24.4% patients only. Mohanty., *et al.* [23] found a thrombotic factor in 60% patients while Edyta., *et al.* found a thrombotic factor in 24.6% patients. Presence of multiple thrombotic factors has been reported by Amarapurkar., *et al.* [31] (19%) and Dutta., *et al.* [32] (13.8%).

Anticoagulant deficiency as a cause of thrombosis was noted in more patients in the present study. Protein C, protein S or AT-III deficiency were found in 5%, 10% and 2.5% of the patients respectively (Table 3). As shown in table, the rate of protein C, protein S and AT-III deficiency varies from 8 - 13.8%, 0 - 10.3% and 0 - 11% patients respectively.

The anticardiolipin antibodies and lupus anticoagulant were detected in 36% and 10% patients respectively in current study. Various studies from India reported presence of ACLA and LA in 6.9 - 13.6% and 3.4 - 5.6% respectively [23,31]. Edyta., *et al.* [30] reported 5.9% and 3.8% of their patients having ACLA and LA.

Thirty three percent patients in present study had hyperhomocysteinemia. Amarapurkar., *et al.* [31] reported hyperhomocysteinemia in 8.7% patients. While Edyta., *et al.* [30], Bhattacharyya., *et al.* [24] and Dutta., *et al.* [32] reported presence of MTHFR gene mutation in 1%, 22.4% and 22% respectively.

10% patients had positive activated protein C resistance. Factor V Leiden mutation has been reported by various Indian studies in range of 5.3 - 21.7% patients [23,24,31,32].

JAK2V617F mutation was seen in 12.8% in present study as compared to that reported by Amarapurkar., *et al.* [31] in 28% patients and by Shetty., *et al.* [26] in 7.8% patients. Thus, our study confirms the findings of previous authors and this findings warrants testing for JAK2V617F mutation in all patients with SVT.

Budd Chiari syndrome: Site of thrombosis was in HV in 50%, HV and IVC in 33.3%, HV and PV in 16.7% patients while none had iso-

lated IVC thrombosis. In the studies reported from India by Dilawari., *et al.* [28] and by Madangopalan., *et al.* [27] the predominant site of obstruction was IVC but recent report suggest that thrombosis of HV with IVC is more common than isolated IVC obstruction [23,25,34]. The findings in the present study were comparable to that with studies done earlier.

The common clinical findings in BCS in present study were abdominal pain (50%), ascites (66%), pedal edema (50%), jaundice (33%), dilated veins over trunk (33%) and hepatomegaly (83%). The classic triad of right upper quadrant pain, ascites and hepatomegaly was seen in 50% patients. None of the patient was asymptomatic. These findings are comparable to that reported in literature. Madanagopalan., *et al.* [27] found that the common clinical features were abdominal pain (64%), ascites (36%), pedal edema (29%), jaundice (4%), dilated veins over trunk (79%), and hepatomegaly (80%). Similar findings were later reported by Dilawari., *et al* [28]. Recent literature reports a presence of classic triad of abdominal pain, ascites and hepatomegaly in two third of the patients while asymptomatic cases being less than 5% [21]. The higher rate of jaundice in present study could be due to associated extensive PVT in one patient and acute viral hepatitis in one patient. Low rate of dilated veins over trunk may be due to early presentation in present study, lack of patient with isolated IVC thrombosis and even the number of patients with IVC and HV thrombosis is less in present study compare to that reported in study by Madanagopalan., *et al.* [27] and Dilawari., *et al* [28].

Different risk factors involved in Portal Vein Thrombosis, Budd Chiari Syndrome are depicted in table 3 and 4.

	No of pts	At least one factor (%)	≥ 2 factor (%)	None$ (%)	PC* (%)	PS* (%)	AT* (%)	ACL! (%)	LA (%)	APCR/ FVL (%)	Hcy#/MTH-FR (%)	JAK## (%)
Dutta., *et al.* [32]	36	25	13.8	75	8	0	11	-	-	11	22	-
Bhattacharyya., *et al.* [24]	93	-	-	-	11.8	6.4	0	-	-	5.3	22.4	-
Edyta., *et al.* [30]	341	24.6	-	-	0.5	3.5	1.5	5.9	3.8	10.9	0	-
Mohanty., *et al.* [23]	88	60	6.8	-	11.3	4.5	2.2	13.6	5.6	18.1	-	-
Amarapurkar., *et al.* [31]	58	-	18.9	-	13.8	10.3	5	6.9	3.4	21.7	8.7	28
Shetty., *et al.* [26]	215	-	-	-	-	-	-	-	-	-	-	7.4
Present study	39	50	30	20	5	10	2.5	36	10	15.3	33.3	12.8

Table 3: Thrombotic factors in splanchnic vein thrombosis in various studies.

$: Patients with no identifiable thrombotic risk factor. *: Protein C, protein S and anti-thrombin-III deficiency. !: Anticardiolipin antibodies. #: Hyperhomocysteinemia/MethylTetrahydroFolate reductase gene mutation. ##: JAK2V617F mutation. APCR/FVL: Activated protein C resistance/ Factor V Leiden Mutation.

	No of patients	At least one factor (%)	≥ 2 factor (%)	None$ (%)	PC* (%)	PS* (%)	AT* (%)	ACL! (%)	LA (%)	APC/FVL (%)	Hcy#/MTH FR (%)	JAK## (%)
Rajani., *et al.* [22]	126	36.5	46	54	-	0.7	2.3	2.3	3.2	10.3	-	11
Pankaj., *et al.*	50	5	-	-	-	-	4	4	-	2	-	-
Dutta., *et al.* [32]	20	25	15	45	10	0	5	10	-	10	15	-
Bhattacharyya., *et al.* [24]	48	15	-	-	8	4	0	-	-	3	21	-
Koshy., *et al.*	112	-	-	-	-	-	-	-	-	2.6	-	-
Mohanty., *et al.* [23]	33	30	-	70	9	3	0	18	-	6	-	-
Sudip., *et al.*	26	70	35	30	46	34.6	30.7	15.3	15.3	11.3	15.3	-
Amarapurkar., *et al.* [31]	35	-	20	-	17.1	11.4	0	5.7	2.8	5.7	2.8	14
Jaswinderat., *et al.*	70	-	-	-	-	-	-	-	-	-	41.2	24
Shetty., *et al.* [26]	78	-	-	-	-	-	-	-	-	-	-	5
Smalberg., *et al.* [33]	92	79	47	22	2	6	4	28	-	3	-	22
Present study	29	79	27	21	6.8	13.7	6.8	38	10.3	10.3	38	10.3

Table 4: Thrombotic factors in portal vein thrombosis in various studies.

$: Patients with no identifiable thrombotic risk factor. *: Protein C, protein S and anti-thrombin-III deficiency. !: Anticardiolipin antibodies., ##JAK2V617F mutation. APCR/FVL: Activated protein C resistance/Factor V Leiden Mutation.

	No of pts	At least 1 factor (%)	≥ 2 factor (%)	No factor$ (%)	PC* (%)	PS* (%)	AT-III* (%)	ACL (%)	LA (%)	APCR/ FVL (%)	Hcy #/MTH FR (%)	JAK## (%)
Rajani., *et al*. [22]	35	-	2.8	11	2.8	0	5.7	5.7	5.7	8.5	5.7	63
Das., *et al*.	9	-	-	-	-	-	-	-	-	22.2	-	-
Dutta., *et al*. [32]	20	36	7	-	7.1	0	21.4	0	0	14.3	35.7	-
Bhattacharyya., *et al*. [24]	53	-	-	-	13.2	7.5	0	-	-	7.5	24	-
Mohanty., *et al*. [23]	53	58.4	11.3	41.6	13.2	5.7	3.8	11.3	9.4	26.4	-	-
Amarapurkar., *et al*. [25]	35	-	11	19	6	3	9	14	6	11.4	-	-
Amarapurkar., *et al*. [31]	23	-	17.3	-	8.7	4.3	13	8.7	4.3	21.7	8.7	40
Shetty., *et al*. [26]	137	-	-	-	-	-	-	-	-	-	-	8.8
Smalberg., *et al*. [33]	40	35	-	-	7	7	0	11	3	15	-	28
Present study	6	100	50	0	0	0	0	50	16.6	33.3	33.3	33.3

Table 5: Thrombotic factors in Budd Chiari Syndrome in various studies.

$: Patients with no identifiable thrombotic risk factor. *: Protein C, protein S and anti-thrombin-III deficiency. !: Anticardiolipin antibodies. #: Hyper homocysteinemia/Methyl Tetrahydro Folate Reductase gene mutation. ##: JAK2V617F mutation. APCR/FVL: Activated protein C resistance/Factor V Leiden Mutation.

JAK2 mutation positive versus negative

13% were positive for JAK2V617F mutation in present study. The white blood cell count was significantly higher in patients with positive JAK2V617F mutation while haemoglobin, hematocrit and platelets were comparable in two groups. The study also revealed that JAK2V617F mutation was more common in BCS patients and it was absent in all patients with cirrhosis. Forty percent of the patients with JAK2V617F mutation also had other identifiable acquired thrombotic risk factor (ACLA and LA) in a study done by Smalberg., *et al.* [33] similar findings were reported. They also reported significant difference in haemoglobin, hematocrit, red blood cell count and platelet count which was not seen in current study. This could be due small study sample size.

Conclusion

The clinical features of splanchnic venous thrombosis (SVT) were diverse. Acute thrombosis was seen in one fourth of the patients. Majority of the patients had portal vein thrombosis.

One third of the patients with PVT had underlying cirrhosis. The usual presentation of patients with portal vein thrombosis was chronic. Presentation with gastrointestinal bleed was more in patients with EHPVO compared to other groups. The PVT was detected incidentally on routine ultrasound screening in forty percent of patients with cirrhosis of liver.

Isolated IVC obstruction as a cause of BCS was found in none of the patients. Most of the patients with BCS had chronic presentation. The classic triad of right upper abdominal pain, ascites and hepatomegaly was seen in half of the patients with BCS.

The remarkable finding of the present study is presence of a thrombotic factor in 80% patients with SVT and the coexistence of two or more factor in one third of these patients.

The prevalence of the somatic (acquired) JAK2V617F mutation was found in 12.8% patients. 40% of the patients with this mutation also had other acquired thrombotic factor. Patients with JAK2V617F mutation had significant leucocytosis compared to that with JAK2V617F mutation.

Limitations of the Study

- Due to rarity of the disease the sample size was small.
- Due to high cost involved there were no controls in present study.
- Presence of anti-cardiolipin antibodies and Lupus anticoagulant were not reevaluated at twelve weeks.

Evaluation for other rare pro thrombotic states like prothrombin gene mutation, PNH and factor VIII (in cirrhosis) were not evaluated particularly in patients with no identifiable risk facto

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