RESULTS

A total of 30 patients with portal hypertension due to liver cirrhosis were admitted to this study. There were no withdrawals. In analysing the relevant information from the data collection standardized forms the following results were obtained.

Age distribution:

The mean age was 32.12 ± 1.8 years ranging from 17 to 52 years. The distribution of patients according to age is shown in figure (17). The majority of patients were in the 20-40 years age group.

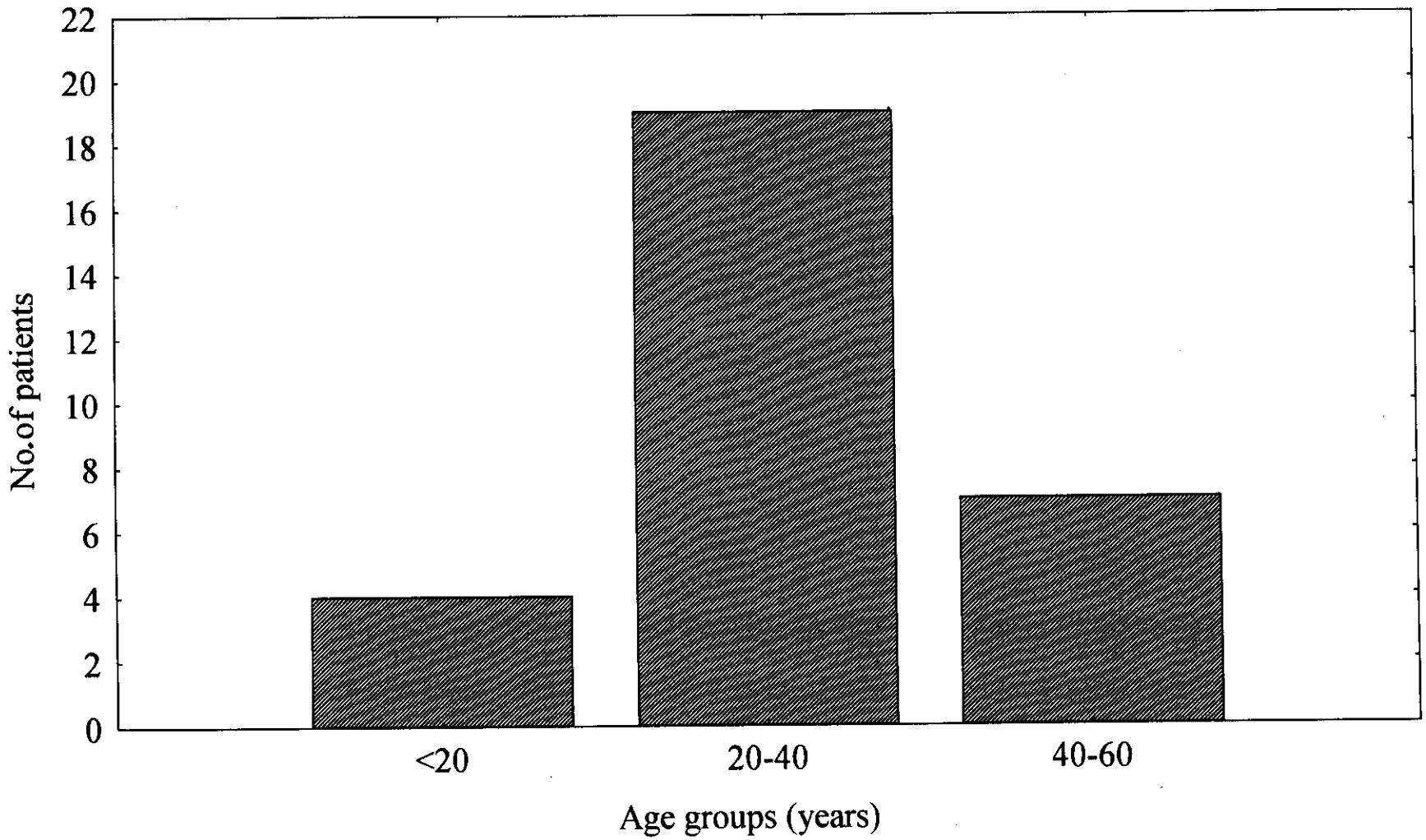
** Sex distribution*:

Among the 30 patients studied there were 19 males (63.3%), and 11 females (36.7%) table (2).

Table (2): Distribution of patients according to sex

	Male	*Female*
Frequency	19	11
Percentage	63.3%	36.7%

Fig(17):Age distribution of 30 patients with poral hypertension



Clinical data:

Complaint:

Pain in the left hypochondrium was a common complaint 19 patients out of the 30 patients included in this study complained of pain in the left hypochondrium. Two patients complained of sense of heaviness in th left hypochondrium, one patient complained of easy fatiugability, and one patient complained of swelling in the left hypochondrum. Five patients were presented by haematemesis and two patients were presented by melena table (3).

Table (3): ***The distribution of patients according to their presenting symptom.***

	Pain.	*Heaviness.*	*Easy fatigue.*	*Swelling.*	*Haemat-emesis*	*Melena*
Frequency	19	2	1	1	5	2
Percentage	63.3%	6.7%	3.3%	3.3%	16.7%	6.7

Past history:

I-Jaundice:

Past history of viral hepatitis or jaundice was present in 14 out of the 30 patients studied table (4).

Table (4): Distribution of cases according to the presence of past history of jaundice

	+ Ve	- Ve
Frequency	14	16
Percentage	46.7%	53.3%

II- Bilharzial infestation:

Past history of bilharzial infestation were present in 22 out of the 30 patients studied table (5).

Table (5): Distribution of cases according to the presence of past history of bilharziasis

	+ Ve	- Ve
Frequency	22	8
Percentage	73.3%	26.7%

+ ve= there was past history of bilharziasis.
- ve= No past history of bilharziasis.

III- Haematemesis:

Past history of haematemesis was present in 17 patients out of the 30 patients studied. Past history of single mild attack of haematemesis was present in 2 patients. Past history of single moderate attack of haematemesis was present in 10 cases. Past history of 2 mild attacks of haematemesis was present in only one patient. Past history of 2 moderate attacks was present in 4 cases table (6).

Table (6): Distribution of patient according to past history of haematemesis

	No	*+ mild*	*+ moderate*	*++ mild*	*++ moderate*
Frequency	13	2	10	1	4
Percentage	43.3%	6.7%	33.3%	3.3%	23.5%

No= no past history of haematemesis.
(+) = number of attacks

IV- Melena:

Past history of melena was present in 29 patients out of the 30 patients included in this study. the distribution of patients studied according to past history of melena is demonstrated in table (7).

Table (7): Distribution of cases according to the past history of melena

	Frequency	*Percentage*
No	1	3.4%
+	15	50%
++	12	44.4%
+++	2	6.9%

No= no past history of melena.
(+) = number of attacks

V- Injection sclerotherapy:

Past history of injection sclerotherapy for bleeding oesophageal varices was present in 8 cases (26.7%). Table (8) shows the number of injection sclerotherapy sittings in those 8 patients.

Table (8): Number of sclerotherapy sittings in the 8 patients recieved sclerotherapy before the operation.

Pt. number	*No. of sclerotherapy sittings*
3	once
6	8 times
7	10 times
9	8 times
11	9 times
14	11 times
15	2 times
30	once

Pt. = Patient
No. = number

Statistical analysis revealed statisticaly positive significant correlation between the diameter of the splenic vein before the operation and the presence of past history of injection sclerotherapy for oesophageal varices. The R-value is 0.445 and the P-value is < 0.05. Also, there is statisticaly positive significant correlation between the volume blood flow of the splenic vein before the operation and the presence of past history of injection scleroptherapy, the R-value is 0.469 and the P-value is less than 0.05 . On

the other hand there is no statisticaly significant correlation between the maximum blood velocity, and the congestion index regarding the presence of past history of injection sclerotherapy table (9).

Table (9): Correlation between past history of injection sclerotherapy and splenic vein haemodynamics before the operation

	Preoperative splenic vein haemodynamics			
	Diameter	***Velocity***	***Flow***	***Congestion index***
R-value	0.445	-0.073	0.469	0.201
P-value	0.014*	0.698	0.009*	0.285

* = significant

Statistical correlation is done between the presence of past history of injection sclerotherapy and the haemodynamics measurments obtained from the portal vein before the operation. The statistical analysis revealed positive statisticaly significant correlation between the diameter of portal vein before the operation and the presence of past history of injection sclerotherapy. The R-value is 0.529 and $P < 0.05$.

Table (10): Correlation between past history of injection sclerotherapy and portal vein haemodynamics before the operation.

	Preoperative splenic vein measurments			
	Diameter	Velocity	Flow	C.I.
R-value	0.529	-0.039	0.327	-0.043
P-value	0.003*	0.835	0.077	0.819

C.I. = Congestion index
* = Significant

* General examination:

I- Jaundice:

On admission to the hospital, and before institution of preoperative preparation, 3 patients were clinicaly jaundiced.

Table (11) shows the distribution of cases according to the presence of clinical jaundice before the operation.

Table (11): The distribution of cases according to clinical jaundice before the operation.

	- Ve	+ Ve
Frequency	27	3
Percentage	90%	10%

-ve= No clinical jaundice
+ve= Clinical jaundice

II- Anaemia:

Anaemia was a common finding. There were 19 patients with obvious pallor among the 30 patients included in this study. The distribution of cases according to the presence or absence of anaemia during clinical examination is demonstrated in table (12).

Table (12): The distribution of cases according to presence or abscence of anaemia during general examination

	- Ve	+ Ve
Frequency	11	19
Percentage	36.7%	63.3%

-ve= No clinical jaundice
+ve= Clinical jaundice

III- Oedema of lower limb:

During preoperative clinical examination, 5 out of the 30 patients studied were suffered from oedema of both lower limbs. The distribution of cases according to the presence or absence of oedema of lower limb is shown in table (13).

Table (13): Distribution of cases according to presence of oedema of lower limb.

	- Ve	+ Ve
Frequency	25	5
Percentage	83.3%	16.7%

-ve= No oedema of lower limbs
+ve= There was oedema of lower limbs.

IV- Neuropsychiatric manifestations:

Thorough general examination of the 30 patients submitted to this study revealed absence of neuropsychiatric manifestations in all patients studied before and after the operation.

V- Symptoms and signs of liver cell failure:

Symptoms and signs of liver cell failure, such as, gynaecomastia, palmar erythema and spider angiomata were absent in all 30 patients included in the study before and after the operation, as Child's C patients were not included in this study.

Abdominal examination:

I- Liver:

As regards the size of the liver, we have 2 groups of patients:

- Group "A": where there was mild hepatomegaly. In those patients, the upper border of the liver was in the fifth intercostal space in the mid clavicular line, the lower border of the liver was felt one finger below the right costal margin (+ or mild hepatomegaly).
- Group "B": where the liver was shrunken and not felt in the middle line or below the right costal margin.

Table (14): Distribution of cases according to the size of the liver

	+ Ve	*- Ve*
Frequency	21	9
Percentage	70%	30%

- ve= Shrunken liver.
+ ve= Hepatomegaly.

II- Spleen:

Splenomegaly was a constant finding, as it was found in all patients studied. According to the degree of splenic elargment the patients submitted to this study is divided into 2 groups:

1) ***Group "A"***:

This group include 13 patients with severe splenomegaly. In this group the upper pole of the spleen reached the 8th intercostal space in the midaxillary line, while the lower pole was 5-8 fingers below the left costal margin.

2) ***Group "B"***:

This include the remaining 17 patients in which the spleen was grossly enlarged. In those patients the upper pole of the spleen reached the 7^{th} intercostal space in the midaxillary line, while the lower pole was more than 8 fingers below the left costal margin reaching the left or right iliac fossa.

In both groups the spleen was firm, not tender, freely mobile with the movements of the diaphragm, with a well defined notch and a smooth surface. The distribution of cases according to the size of the spleen is shown in table (15).

Table (15): Distribution of patients according to the size of the spleen

	+++	++++
Frequency	13	17
Percentage	43.3%	56.7%

+++ = Severe splenomegaly
++++= Gross splenomegaly

III- Ascites:

Abdominal examination revealed that there was only one patient with ascites, while in the remaining 29 patients ascites could not be detected by clinical examination. The distribution of cases according to the presence of clinical ascites is shown in table (16).

Table (16): Distribution of cases according to the presence of clinical ascites.

	Ascites	No ascites
Frequency	1	29
Percentage	3.3%	96.7%

IV- The collateral circulation:

The collateral circulation on the anterior abdominal wall were present in 4 cases. It presents itself in the form of dilated veins on the anterior abdominal wall, in the region below the umblicus, and in the epigastrium. The blood flow directed from above downwards, below the level of the umblicus. Table (17) shows the distribution of cases studied according to the presence of collateral circulation of the anterior abdominal wall.

Table (17): Distribution of patients according to the presence of collateral circulation on the anterior abdominal wall

	+ Ve	- Ve
Frequency	4	26
Percentage	13.3%	86.7%

+ve= There were collaterals
-ve= No collaterals

V- Hernia:

Among the 30 patients submitted to this study, there were 4 patients with indirect oblique ingiunal hernia, and 3 patients with umblical hernia. The distribution of cases according to the presence of hernia is shown in table (18).

Table (18): Distribution of cases according to the presence of hernias

	- Ve	Ing.H.	Umbl.H.
Frequency	23	4	3
Percentage	76.7%	13.3%	10%

-ve = No hernia.
Ing.H. = Ingiunal hernia.
Umbl.H.= Umblical hernia.

Laboratory investigations:-

1. Haemoglobin:

Before the operation haemoglobin concentration ranged between 6.5 g to 14.4 g/dl with a mean of 10.22±1.57 g/dl.

Two week after the operation haemoglobin concentration ranged between 11 g to 16.2 g with a mean of 12.27±0.842 g, the difference between preoperative and postoperative haemoglobin concentration is statistically highly significant table (19) and figure (18).

Table (19): The differnce between haemoglobin conentration before and after the operation.

Variable	*Mean*	*S.D.*	*Diff.*	*t-value*	*P*
Hb pre	10.22	1.579	2.053	9.524	0.001*
Hb post	12.273	0.842			

Hb pre = haemoglobin concentration preoperatively
Hb post= haemoglobin concentration postoperatively
* = significant

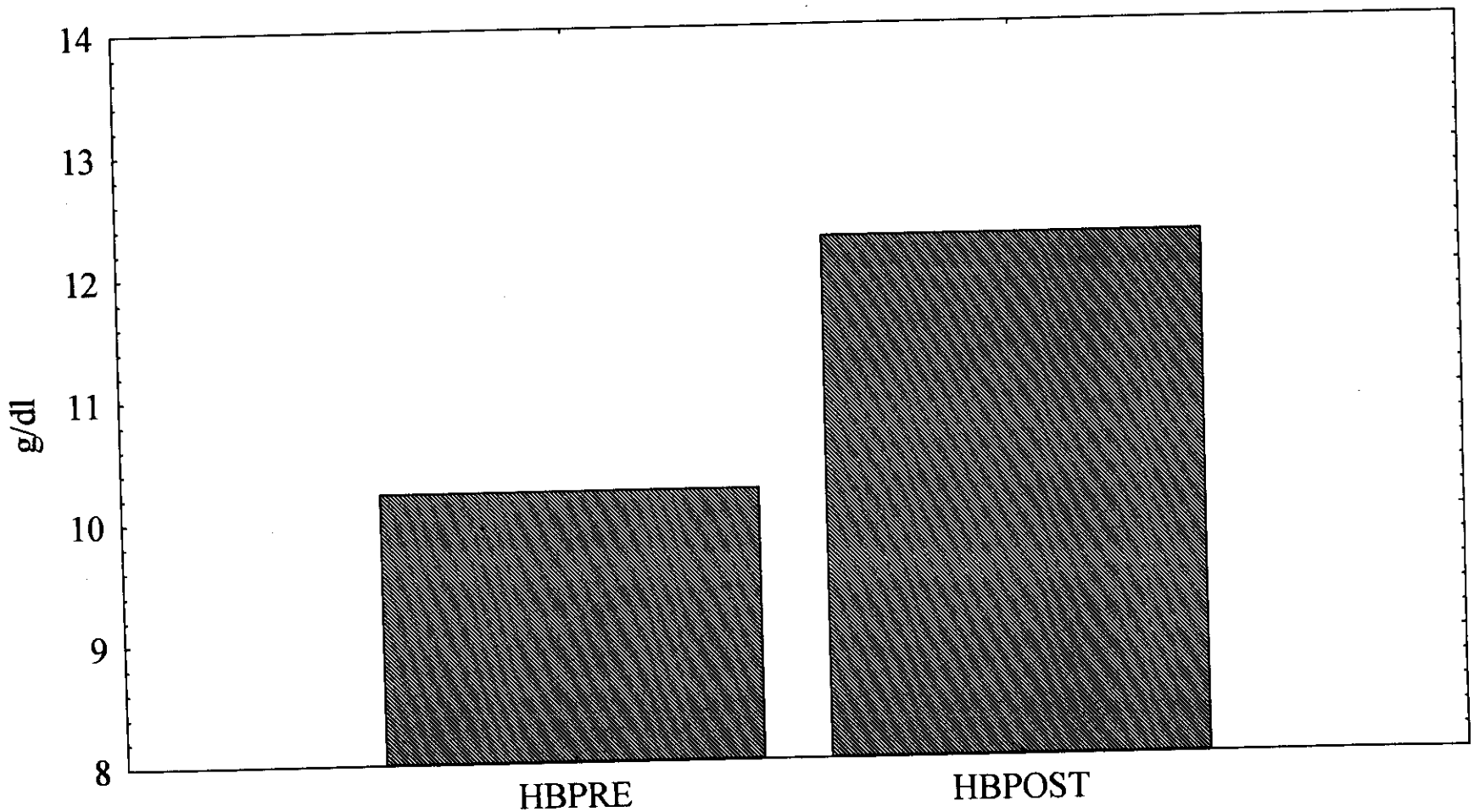


Fig. (18). The difference between haemoglobin concentration before and after the operation

2. *Haematocrit:-*

Preoperative assessment of haematocrit value revealed that it ranged between 21% to 40% with a mean of 30.383±4.525. Postoperatively haematocrit value ranged between 31% to 42% with a mean of 36.130±2.998. The difference between preoperative and postoperative haematocrit values is statistically significant (table 20).

Table (20): Comparison between haematocrit value before and after the operation.

Variable	*Mean*	*S.D.*	*Diff.*	*T-value*	*P*
Ht pre	30.383	4.525	5.746	8.715	0.001*
Ht post	36.130	2.998			

Ht pre = haematocrit value preoperatively
Ht post= haematocrit value postoperatively
* = significant

3. *Total leucocytic count:-*

Leucopenia was present in all patients. Total leucocytic count was ranged between 1500/mm^3 to 4300/mm^3 with a mean of 2683.3±1303.8.

Postoperatively the total leucocytic count increased considerably, as it was ranged between 6200/mm^3 to 14800/mm^3 with a mean of 9203.5±3074.4. The difference between preoperative and postoperative total leucocytic count is statistically significant (table 21 and figure 19).

Table (21): Comparison between total leucocytic count before and after the operation.

Variable	*Mean*	*S.D.*	*Diff.*	*t-value*	*P*
T.L.C. pre.	2683.33	1303.86	6520.22	10.656	0.0001*
T.L.C. post.	9203.55	3074.41			

T.L.C.= total leucoytic count
* = significant

4. Platelets count:-

Thrombocytopenia was a constant finding among the patients included in this study. Before the operation platelts count was ranged between 18.000/mm^3 to 112.000/mm^3 with a mean of 52.33±21.83. However, after the operation the platelet count increased considerably, and it ranged

between 187.000/mm^3 to 642.000/mm^3 with a mean of 333.600±122.173. The difference between platelts count preoperatively and postoperatively is statistically significant (table 22 and figure 20).

Table (22): Comparison between platelts count before and after the operation.

Variable	*Mean*	*S.D.*	*Diff.*	*T-value*	*P*
Plat.pre.	52.333	21.836	281.267	12.331	0.0001*
Plat.post.	333.600	122.173			

Plat. = platelts count
* = significant

5. Liver function tests:-

(i) Total serum libirubin:

Total serum bilirubin before the operation ranged between 0.6 mg/dl to 2.6 mg/dl with a mean of 1.2±0.518. Total bilirubin rose after the operation, as it ranged between 0.7 mg/dl to 3.5 mg/dl with a mean of 1.5±0.768, the difference is statistically significant (table 23).

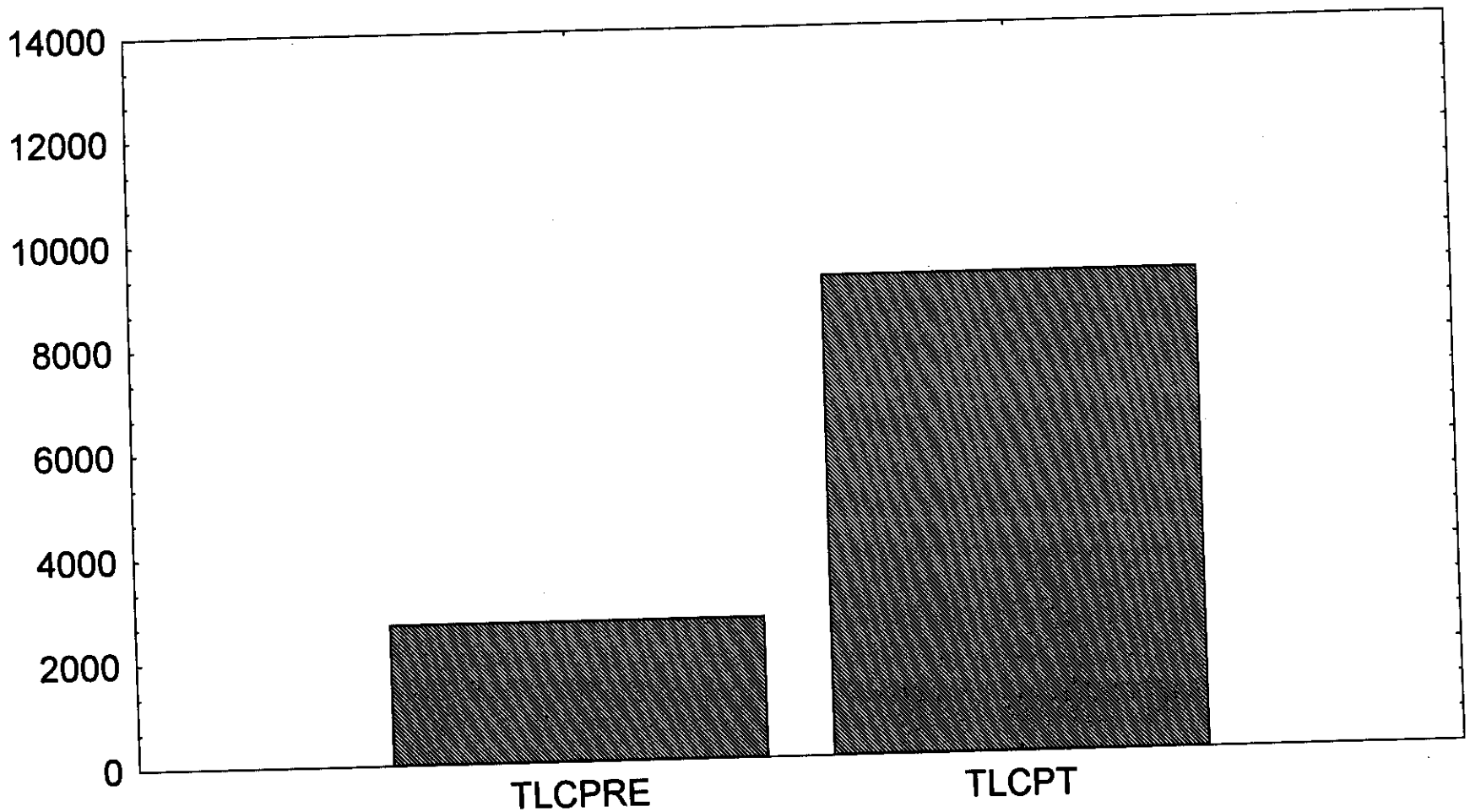


Fig.(19): The differance between total leucocytic count before and after the operation

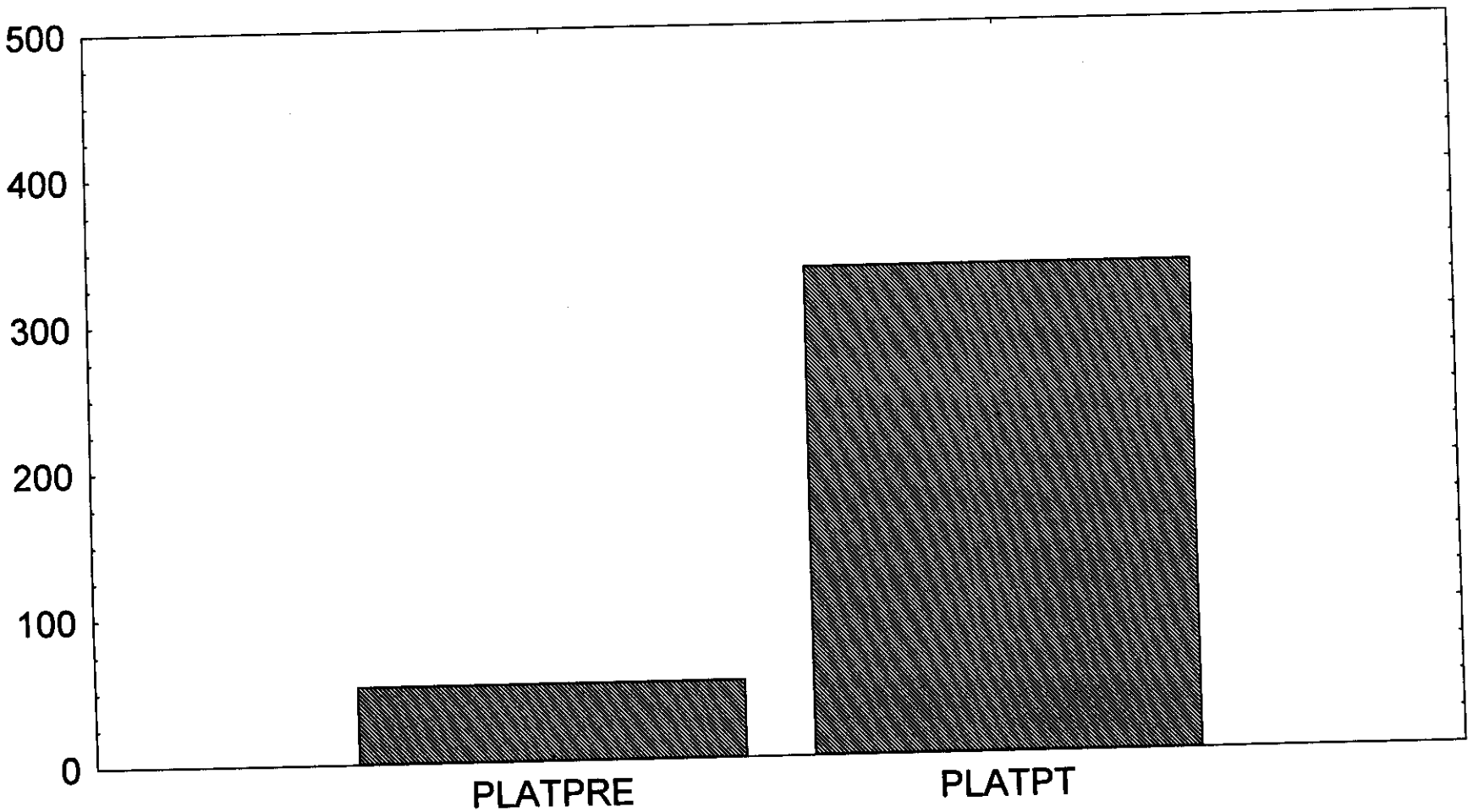


Fig.(20): The difference between plateletes count before and after the operation

Table (23): Comparison between total serum bilirubin before and after the operation

Variable	Mean	S.D.	Diff.	t-value	P
T.B. pre.	1.206	0.518	0.300	3.465	0.001*
T.B. post.	1.506	0.768			

T.B. = total bilirubin

* = significant

(ii) Direct serum bilirubin:

Also, direct serum bilibrubin was estimated in all patients submitted to this study. Preoperative direct serum bilirubin ranged between 0.00 mg/dl to 0.90 mg/dl with a mean of 0.310 ± 0.272. However postoperatively it ranged between 0.10 mg/dl to 1.20 mg/dl with a mean of 0.470 ± 0.260. The difference is statistically significant (table 24).

Table (24): Comparison between direct serum bilirubin before and after the operation.

Variable	Mean	S.D.	Diff.	t-value	P
D.B. preop.	0.310	0.272	0.160	5.442	0.001*
D.B. postop.	0.470	0.260			

D.B. = direct bilirubin
* = significant

(iii) Serum transaminases:

The serum transaminases were estimated before and after the operation for all 30 patients submitted to this study. Before the operation the serum glutamic oxalacitic transaminase ranged from 35 u/L to 93 u/L with a mean value of 60.366±26.244. After the operations the results were above the preoperative values ranging between 39 u/L to 123 u/L units with a mean of 79.866 ± 28.774. The difference is statistically significant (table 25).

Table (25): Comparison between SGOT values before and after the operation.

Variable	Mean	S.D.	Diff.	T-value	P
SGOT preop.	60.366	26.244	---	---	---
SGOT postop.	79.866	28.774	19.500	8.727	0.0001*

* = significant

As regards the serum glutamic pyruvic transaminase, the results of the test before operation varied from 28 u/L to 85 u/L with a mean of 37.833±49.600, whereas the postoperative values ranged from 29 u/L to 98 u/L with a mean of 49.60±21.656. The difference is statistically significant (table 26).

Table (26): Comparison between SGPT values preoperatively and postoperatively

Variable	Mean	S.D.	Diff.	t-value	P
SGPT preop.	37.833	18.580	11.766	4.899	0.0001*
SGPT postop.	49.600	21.656			

(iv) Alkaline phosphatase:

Before the operation, serum alkaline phosphatase values ranged from 62 Iu/L to 143 Iu/L with a mean of 88.40±81.14. After the operation it was ranged from 65 to 158± Iu/L with a mean of 83.46±28.48. This reduction in the serum alkaline phosphatase values after the operation is not statistically significant (table 27).

Table (27): Comparison between serum alkaline phosphatase before and after the operation.

Variable	Mean	S.D.	Diff.	t-value	P
Alk. ph. preop.	88.400	81.143	4.933	0.332	0.741
Alk. ph. postop.	83.466	28.480			

Alk. ph. = alkaline phosphatase

(v) Serum albumin:-

Before the operation plasma albumin ranged from 2.4 to 4.3 g/dl with a mean of 3.426 ± 0.523 whereas it rose after the operation and ranged from 2.8 to 4.5 g/dl with a mean of 3.71 ± 0.346. This increase in the plasma albumin level after the operation is statistically significant (table 28).

Table (28): Comparison between serum albumin level before and after the operation.

Variable	Mean	S.D.	Diff.	t-value	P
Alb. preop.	3.426	0.523	0.286	3.640	0.001*
Alb. postop.	3.713	0.346			

Alb. = albumin
* = significant

(vi) Prothrombin concentration:-

Hypoprothrombinaemia was a common finding, ranging between 34% to 86% with a mean of 62.866±12.580. After the operation prothrombin concentration rose and ranged from 61% to 89% with a mean of 74.140±6.918. This increase in the prothrombin concentration is statistically significant (table 29).

Table (29): Comparison between prothrombin concentration before and after the operation.

Variable	Mean	S.D.	Diff.	t-value	P
Proth. preop.	62.866	12.580	11.273	6.877	0.0001*
Proth. postop.	74.140	6.918			

Proth. = prothrombin concentration
* = significant

(vii) Kidney function tests:-

Before the operation blood urea level was ranged from 16 to 38 mg/dl with a mean of 24.633±6.332, whereas it rose after the operation ranging from 17 to 48 mg/dl with a mean of 27.366±7.194. This increase in the blood urea level after the operation is statistically significant. As regard creatinine level before the operation, it was ranged from 0.6 to 1.1 mg/dl with a mean of 0.76±0.109. After the operation it was ranged from 0.5 to 1.0 mg/dl with a mean of 0.76±0.124. This slight reduction in the creatinine level after the operation is statistically insignificant (table 30).

Table (30): Comparison between renal function tests before and after the operation.

Variable	Mean	S.D.	Diff.	t-value	P
Urea preop.	24.633	6.332	2.733	3.264	0.002*
Urea postop.	27.366	7.194			
Creat. preop.	0.763	0.109	0.003	0.149	0.881
Creat. postop.	0.760	0.124			

Creat. = creatinine
* = significant

(viii) Hepatitis markers:-

Hepatitis "B" antibodies were found in 14 patient. In 9 cases antibodies for hepatitis "C" were found. In the remaining 7 cases antibodies for both hepatitis "B" and "C" were found. The distribution of patients according to the laboratory evidences of previous infection with hepatitis viruses is shown in (table 31).

Table (31): Distribution of cases according to hepatitis markers.

	B	C	B & C
Frequency	14	9	7
Percentage	46.7%	30.3%	23.3%

B = hepatitis "B"
C = hepatitis "C"

(ix) Bone marrow examination:

Bone marrow aspiration from the sternum or iliac bone was done for every patient included in this study to confirm the diagnosis of hypersplenism. The results of examinations of the bone marrow aspirates for all the 30 patients studied were with the diagnosis of hypersplenism.

Child's classification:

All patients included in this study were classified according to modified Child's classification. As mentioned before in methodology, patients catagorized as Child "C" were excluded from the study, so we have

only two groups of patients: group one include patients catagorized as Child "A", and group two which include patients catagorized as Child "B". Table (32) shows that among the 30 patients studied, there were 10 patients catagorized as Child "A", and 20 patients catagorized as Child "B" (33.3% and 66.7% respectively).

Table (32): Distribution of patients according to modified Child's classification:

	Child "A"	Child "B"
Frequency	10	20
Percentage	33.3%	66.7%

Abdominal ultrasonography:-

Abdominal ultrasonography was done for every patient included in this study before and 2 weeks after the operation.

1- ***Preoperative results***:

As regard the size of the liver and spleen, abdominal ultrasonography confirm the results obtained by clinical examination. In case of ascites, ultrasonography was more sensitive than clinical examination, as 4 cases with ascites were reported by ultrasonography, while clinical examination revealed only a single case of ascites. Also, ultrasonography discovered 2 cases of calcular gall bladder.

Table (33): The results obtained from ultrasonography before the operation.

	Hapatomeg.	*Shrunken liver*	*Splenomeg.*	*Ascites*	*Calc. G.B.*
Frequency	21	9	30	4	2
Percentage	70.2	29.8	100%	13.3	6.6

Hepatomeg.= hepatomegaly
Splenomeg.= splenomegaly
Calc. G.B.= calcular gall bladder

2- ***Postoperative results***:-

Abdominal ultrasonography was repeated 2 weeks after the operation for all 30 patients studied. There were 5 patients with fluid collection in the left subphrenic space. Also, there was a single patient with left pleural effusion and left subphrenic collection. In those 6 patients ultrasonography guided aspiration was done, and the samples obtained were sent for culture and sensitivity test. The results of culturing of these 6 samples were no bacterial growth. As regards ascites, there were 5 patients with ascites after the operation, compared with only 4 patients with ascites before the operation. Also, portal vein thrombosis was discovred in 5 cases after the operation. In those 5 patients with postoperative portal vein thrombosis the thrombi were small, not occluding the portal vein lumen and on redoing the ultrasonography one week later the thrombi were recanalized.

Table (34): The results obtained from abdominal ultrasonography after the operation.

	Collection	*Pl.eff.*	*Ascites*	*P.V. thromb.*
Frequency	5	1	5	5
Percentage	16.6%	3.3%	16.6%	16.6%

Pl.eff.= Pleural effusion
P.V. thromb.= portal vein thrombosis

Gastrointestinal endoscopy:

Gastrointestinal endoscopy was done for all patients studied before the operation and 2 weeks after the operation.

1- ***Preoperative results***:-

Before the operation gastrointestinal fibroptic endoscopy revealed that there were 3 cases of grade II oesophageal varices and gastric varices, 13 patients with grade III oesophageal varices, one patient with grade III oesophageal varices and gastric varices, 11 patient with grade IV

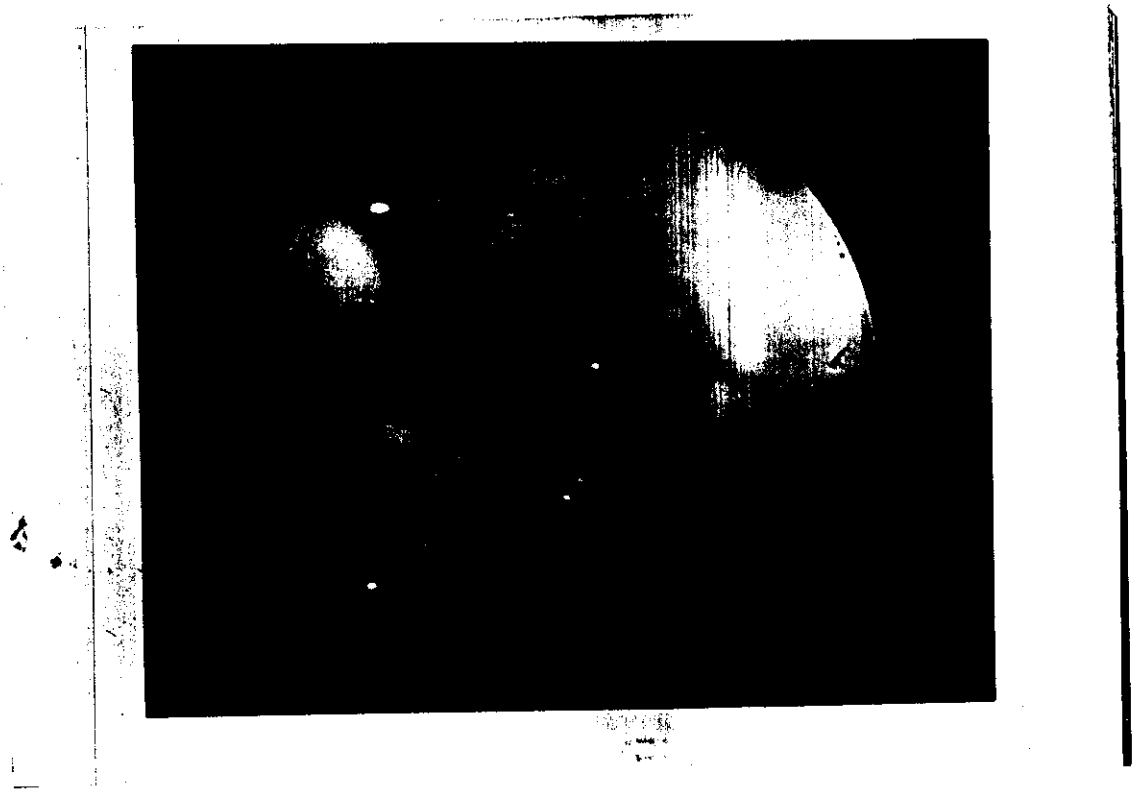
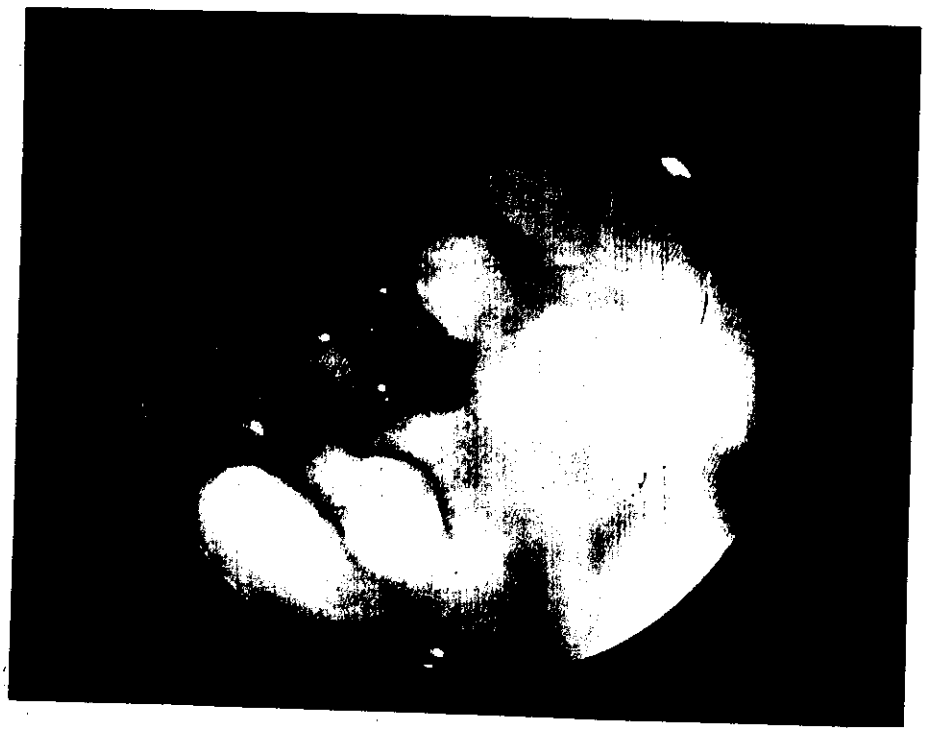


Fig. (21): *Grade III oesophageal varices.*



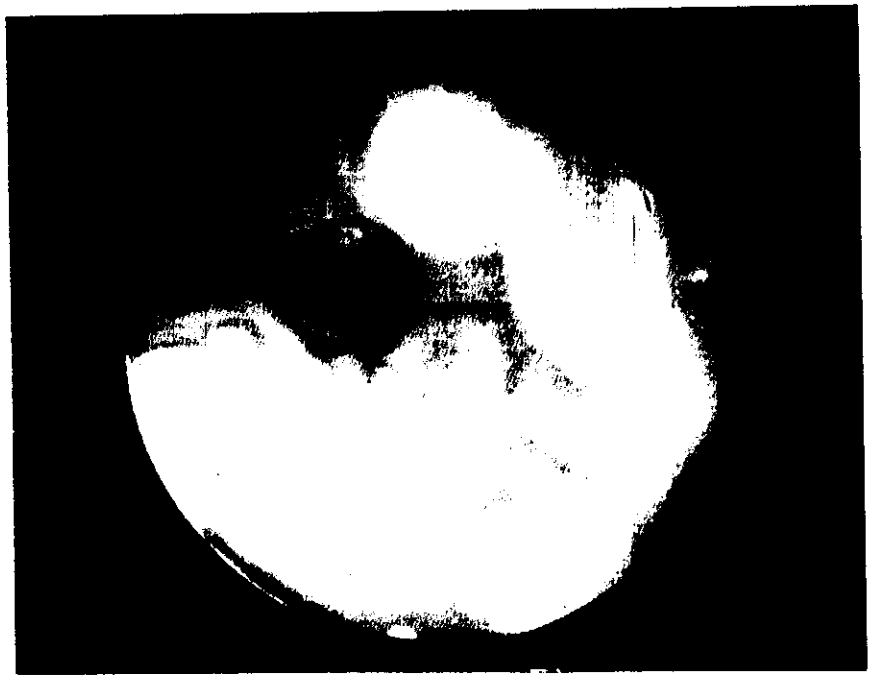
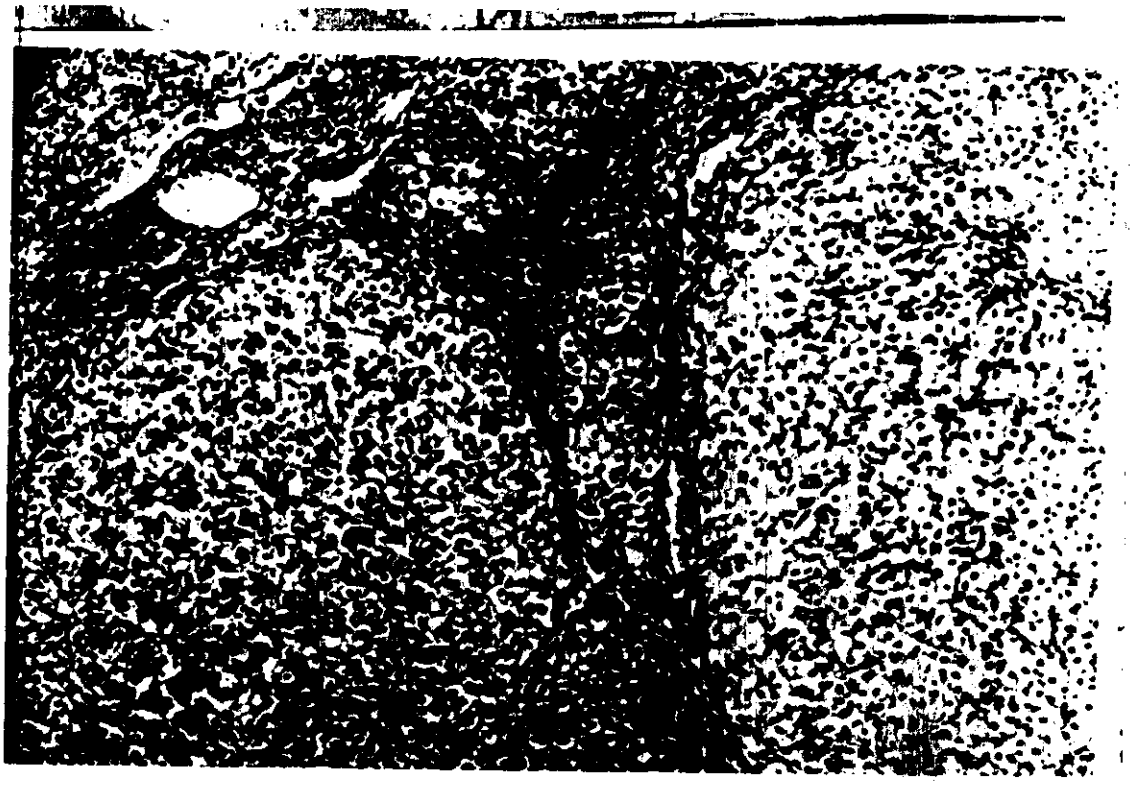


Fig. (23): *Gastric varices.*



2. ***Postoperative results***:-

On redoing the upper G.I. endoscopy after the operation the following results were obtained:

A) There were 11 patients with grade I varices

B) There were 14 case with grade II varices.

C) There were no patient with grade III, grade IV or gastric varices.

Table (36): The distribution of cases according to the results of postoperative G.I. endoscopy.

	Grade I	*Grade II*	*Grade III*	*Grade IV*	*G.V.*
Frequency	11	14	0	0	0
Percentage	36.6%	46.6%	0	0	0

Statistical analysis of the results obtained from G.I. endoscopy before and after the operation revealed that there is statistically significant reduction in the grade of oesophageal varices after the operation (table 37 and figure 25). As regard the gastric varices, it disappeared completely after the

operation either in the 2 patients with only gastric varices or in the 3 patients with gastric varices and oesophageal varices.

Table (37): Comparison between grades of oesophageal varices before and after the operation

Postop. / *Preop.*	*I*	*II*	*III*	*IV*	*Total*
I	0	0	0	0	0
II	3	0	0	0	3
III	7	7	0	0	14
IV	4	7	0	0	11
Total	14	14	0	0	28
Chi-square	27.619				
P-value	0.0001**				

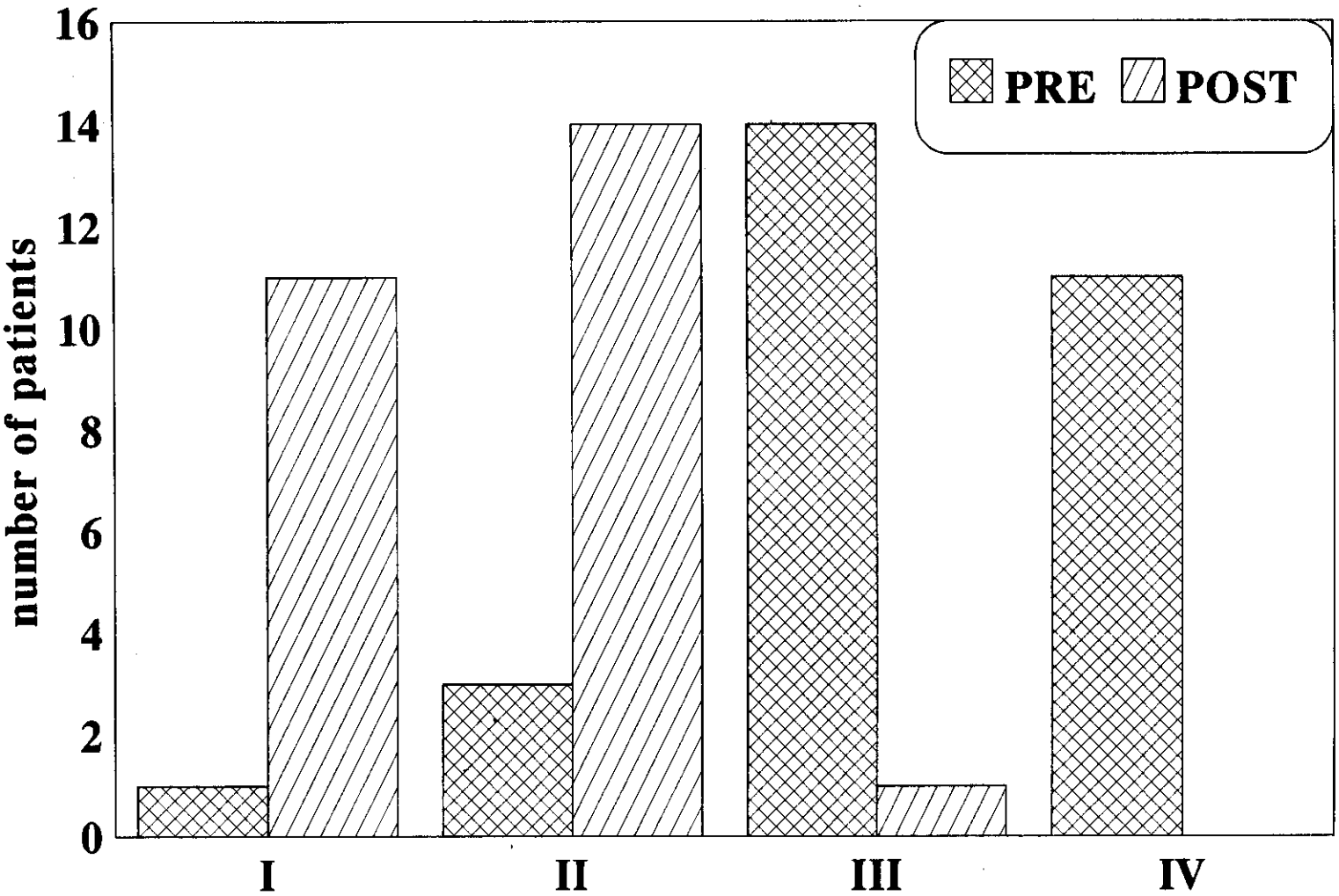
**= Highly significant.

Table (38): Comparison between the results of upper G.I. endoscopy before and after the operation as regard gastric varices

Postop. / Preop.	- Ve	+ Ve	Chi-square	P
- Ve	24	0	4.137	0.041*
+ Ve	6	0		
Total	30	0		

*= Significant.
- Ve= No gastric varices
+ Ve= there were gastric varices

Fig.(25):Comparison between grades of oesophageal varices before and after the operation



Color Doppler scanning:-

All patients submitted to this study were scanned before and 2 week after the operation by color doppler scanner.

A. ***Preoperative portal vein scanning***:

The diameter of the portal vein before the operation was ranged from 1.1 to 1.8 cm with a mean of 1.34 ± 0.02 cm. Maximum blood velocity in the portal vein before the operation was ranged from 8.04 to 20 cm/sec. with a mean of 12.5 ± 0.57 cm/sec. volume blood flow in the portal vein before the operation was ranged from 524.5 to 2689 ml/min. with a mean of 1073 ± 77.12 ml/min. The congestion index of the portal vein before the operation was ranged from 0.049 to 0.9 with a mean value of 0.138 ± 0.027. The direction of blood flow in the portal vein was toward the liver (hepatopetal) in 29 patients, and only in one patient the blood flow in the portal vein was bidirectional (table 39).

Table (39): The results obtained from Doppler scanning of the portal vein before the operation.

Variable	Diameter	Velocity	Flow	C.I.
Mean	1.34	12.5	1073	0.138
S.D.	0.024	0.57	77.12	0.007

C.I. = congestion index.

B. ***Preoperative splenic vein scanning***:

The diameter of the splenic vein before the operation was ranged from 0.7 to 1.5 cm. with a mean of 1.03 ± 0.04 cm. Maximum blood velocity in the splenic vein before the operation was ranged from 6.5 to 19.4 cm/sec with a mean value of 11.83 ± 0.59 cm/sec. Volume blood flow of the splenic vein before the operation was ranged from 297.3 to 2052.8 ml/min with a mean of 594.9 ± 58.7 ml/min (table 40). The direction of blood flow was hepatopetal in 26 patients, in the remaining 4 patients hepatofugal flow was detected.

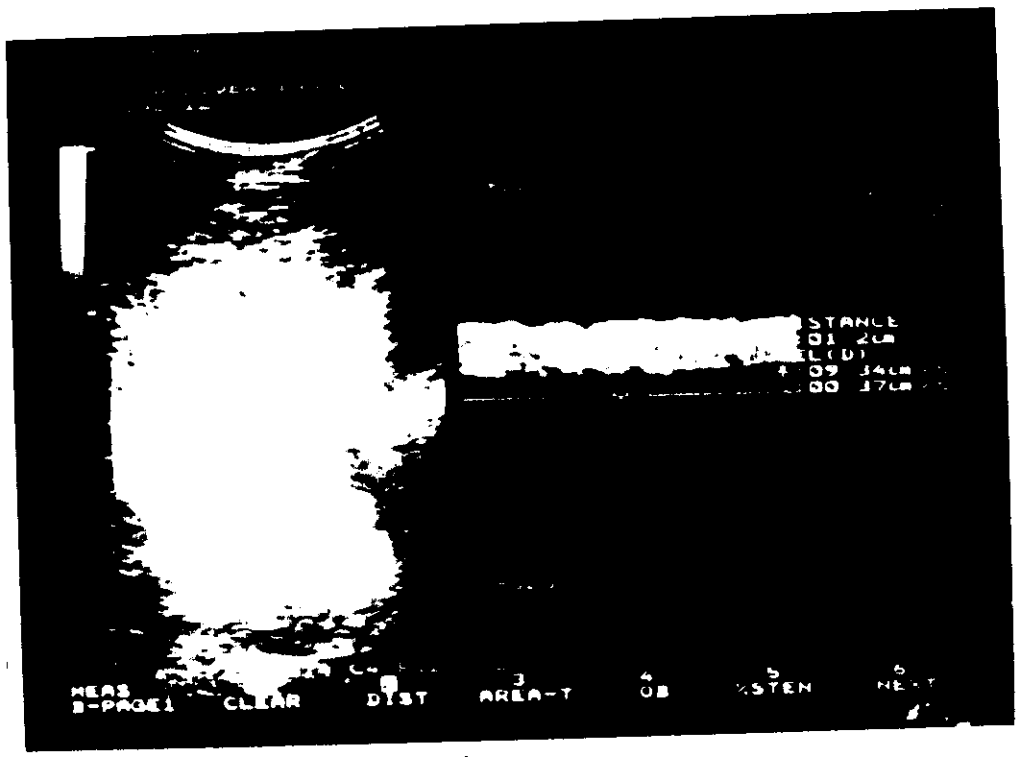


Fig. (26) Doppler scanning of the splenic vein shows dilated vein (1.2 c.m) and the direction of blood flow in the splenic vein is hepatofugal .

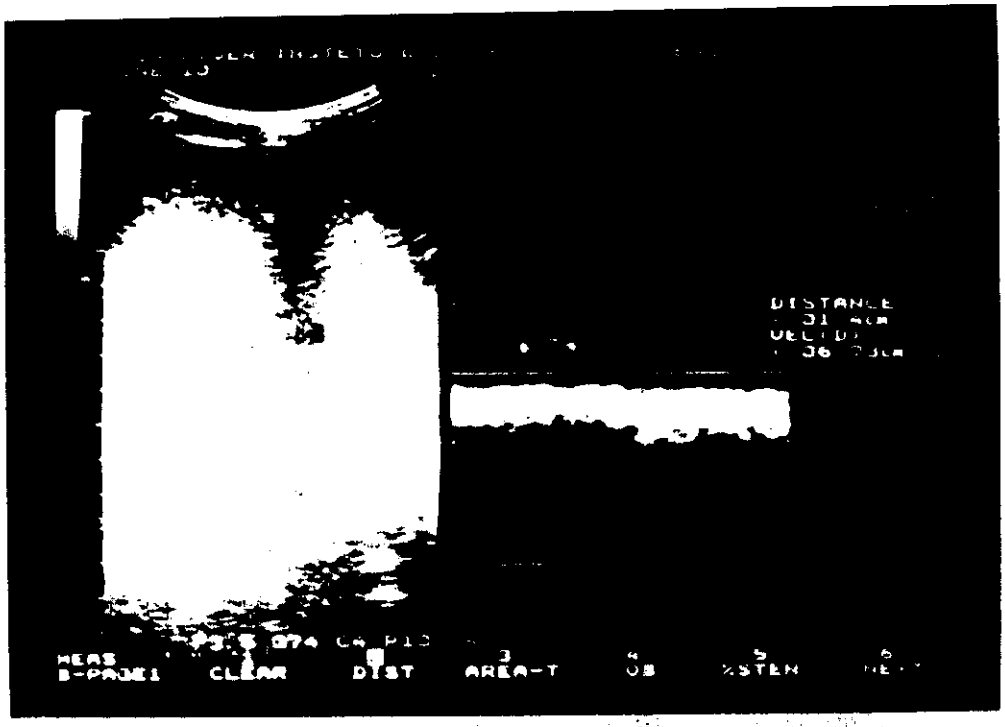


Fig. (27) Doppler scanning of the portal vein of the same patient shows slow blood

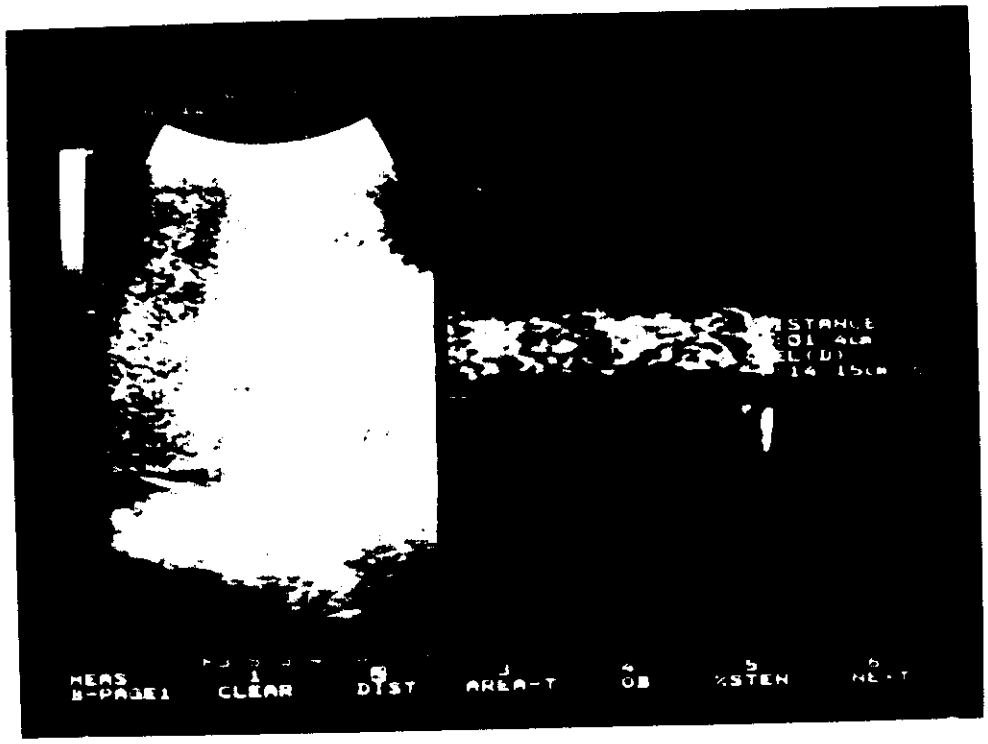


Fig. (28) Doppler scanning of the portal vein before the operation .

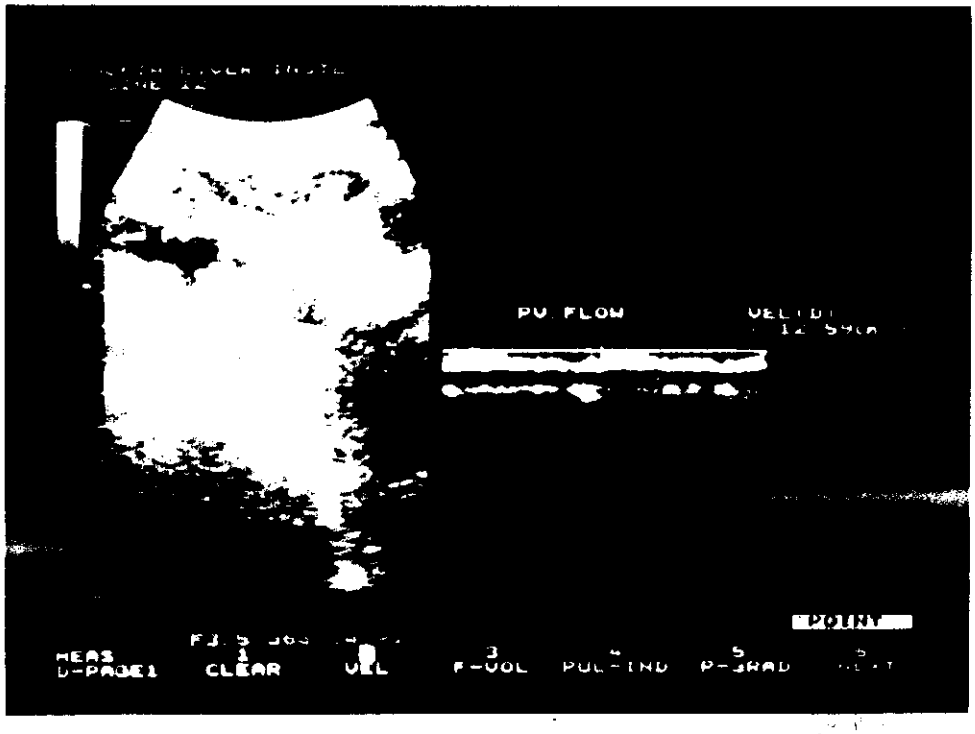


Fig. (29) Doppler scanning of the portal vein after the operation . It shows a

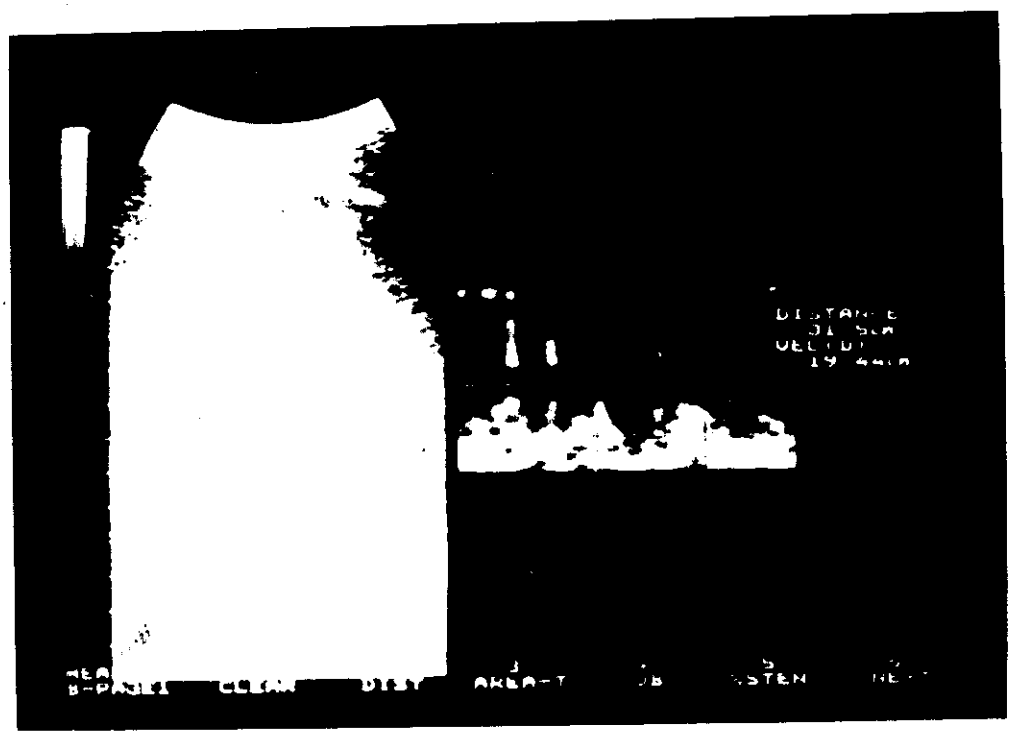


Fig. (30) Doppler scanning of the portal vein before the operation shows dilated portal vein (1.5 c.m) and hyperdynamic blood flow (blood velocity = 19.4 c.m / sec.)

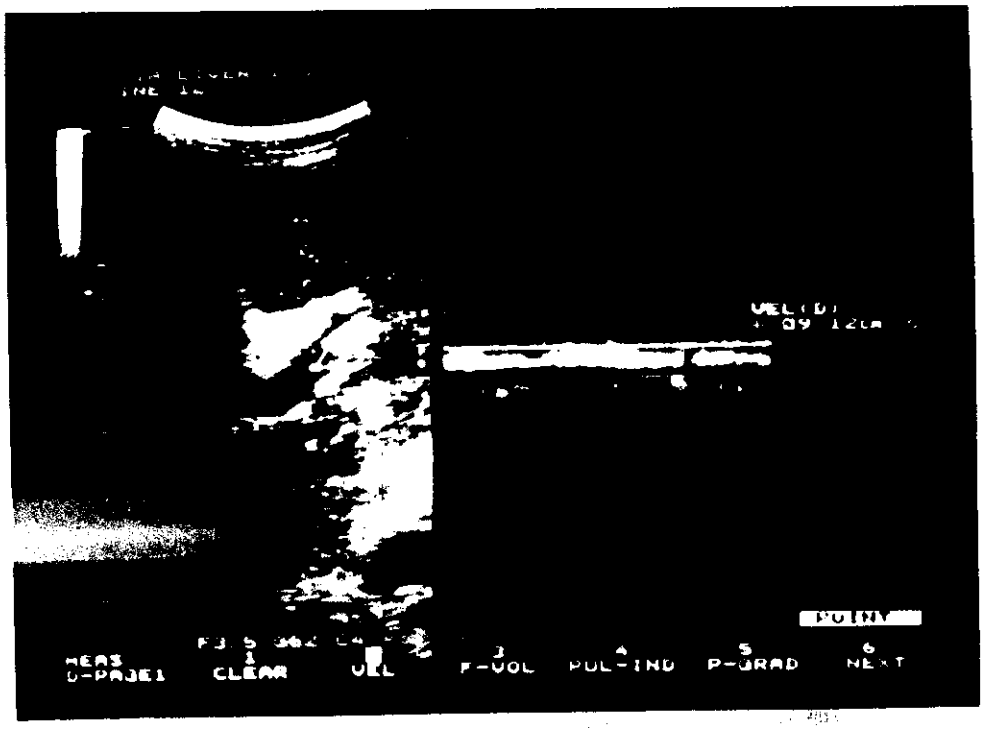


Fig. (31) Doppler scanning of the portal vein after the operation shows reduction in

Fig. (32) postoperative thrombosis of the main portal vein .

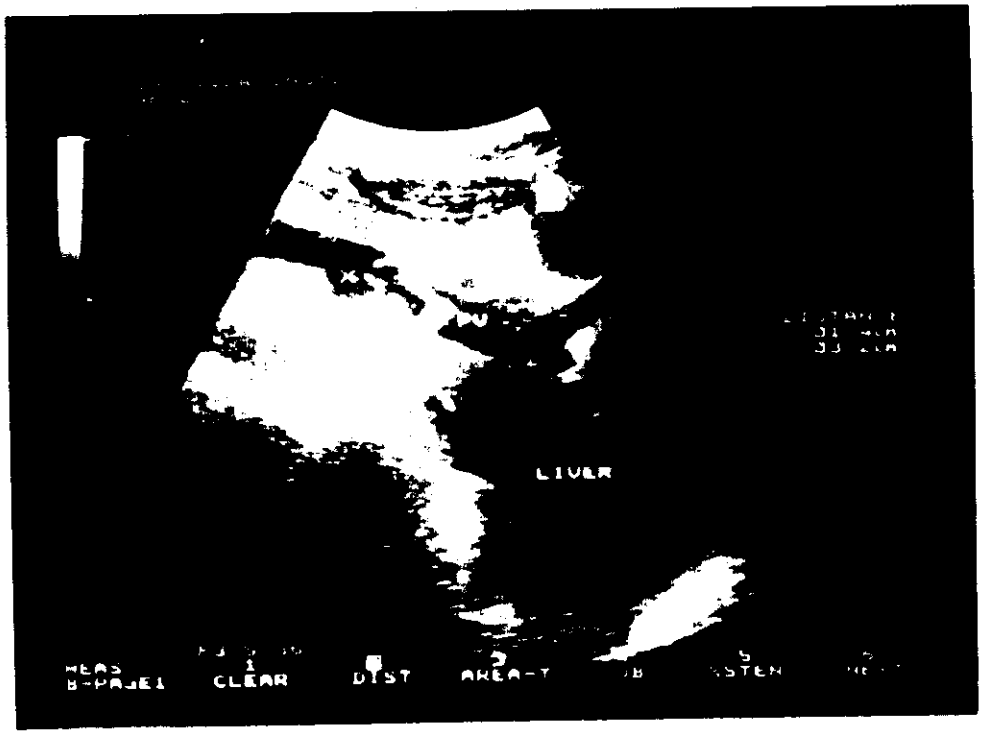


Fig. (33) starting recanalization in postoperative portal vein thrombosis .

Table (40): The results obtained from Doppler scanning of the splenic vein before the operation.

Variable	Diameter	Velocity	Flow
Mean	1.03	11.83	594.9
S.D.	0.04	0.59	58.7

Statistical correlation was done between Doppler measurments obtained from the portal vein and the splenic vein before the operation. This statistical analysis revealed statistically significant correlation between the diameter of the splenic vein and the maximum blood velocity in the portal vein before the operation. Also, there are statistically significant correlations between the maximum blood velocity in the splenic vein before the operation and the diameter, maximum blood velocity, and volume blood flow in the portal vein before the operation. Moreover, there are statistically significant correlation between volume blood flow in the splenic vein before the operation, and the diameter, and volume blood flow in the portal vein before the operation (table 41 and figures 34, 35 & 36).

Table (41): Correlation between portal and splenic vein measurments before the operation.

	P.V diameter	*P.V velocity*	*P.V flow*	*P.V. C.I.*
S.V. Diameter pre	R= 0.315 P= 0.869	R= 0.408 P= 0.025*	R= 0.124 P= 0.511	R= 0.333 P= 0.072
S.V. Velocity pre	R = 0.456 P= 0.011*	R= 0.461 P= 0.010*	R= 0.584 P= 0.001*	R= 0.258 P= 0.168
S.V. Flow pre	R= 0.0530 P= 0.003*	R= 0.089 P= 0.637	R= 0.520 P= 0.003	R= 0.131 P= 0.487
S.V. C.I. pre	R= 0.016 P= 0.932	R= 0.242 P= 0.196	R= 0.121 P= 0.523	R= 0.185 P= 0.326

p.v. = portal vein
pre = preoperative
* = significant
s.v. = splenic vein
c.I. = congestion index

C. ***Postoperative portal vein scanning***:

Color Doppler scanning of the portal vein was repeated after the operation for all 30 patients studied. The diameter of the portal vein 2 weeks after the operation ranged from 1.2 to 1.8 cm with a mean value of

1.33±0.022 cm. Maximum blood velocity ranged from 7.76 to 18 cm/sec with a mean value of 10.59±0.48 cm/sec. Volume blood flow ranged from 583.7 to 1389 ml/min. with a mean value of 884.3±42.7 ml/min. The congestion index ranged from 0.048 to 0.21 with a mean value of 0.131±0.007. The direction of blood flow in all 30 patients studied was hepatopetal after the operation table (42).

Table (42): Measurment obtaineds from Doppler scanning of portal vein after the operation.

Variable	*Diameter (cm)*	*Velocity (cm/sec.)*	*Flow (ml/min.)*	*C.I.*
Mean	1.33	10.59	884.3	0.131
S.D.	0.022	0.48	42.7	0.007

The relation between the measurments obtained from the portal vein before and after the operation was studied on statistical basis. Before the operation the diameter of portal vein was slightly wider than after the operation, but this reduction in the diameter of the portal vein is statistically insignificant. The maximum blood velocity in the portal vein decreased after

the operation, and this reduction is statistically significant. The volume blood flow in the portal vein was also decreased after the operation, and this decrease is statistically significant. As regard, the congestion index, it was almost the same before and after the operation (table 43 and figures37, 38, & 39).

Table (43): Comparison between Doppler measurments of the portal vein before and after splenectomy and devascularization

	Mean	S.D.	Diff.	t-value	P
Diameter preop.	1.340	0.132	0.003	0.3725	0.712
Diamter postop.	1.337	0.124			
Velocity preop.	12.510	3.155	1.917	4.926	0.001*
Velocity postop.	10.593	2.655			
Flow preop.	1073.8	422.4	189.4	3.854	0.0001*
Flow preop.	884.3	233.9			
C.I. preop.	0.138	0.149	0.006	0.235	0.815
C.I. postop.	0.132	0.040			

C.I.= congestion index.
* = significant

The direction of blood flow in the portal vein after the operation was hepatopetal in all patients (100%).

Fig.(34): Correlation between the velocity of the splenic vein and the diameter of the poral vein before the operation

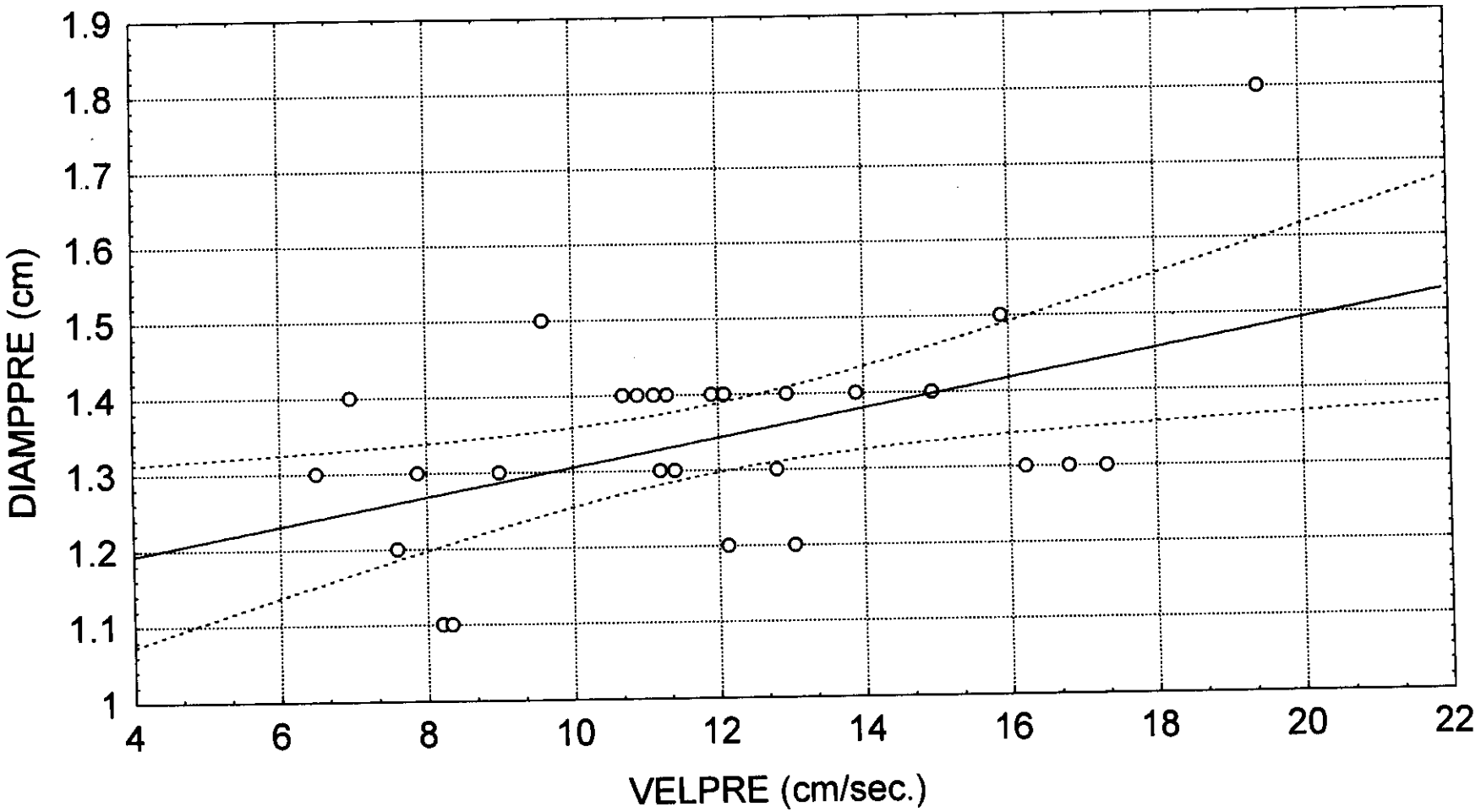


Fig.(35) Correlation between the diameter of the splenic vein and the congestion index of the portal vein before the operation

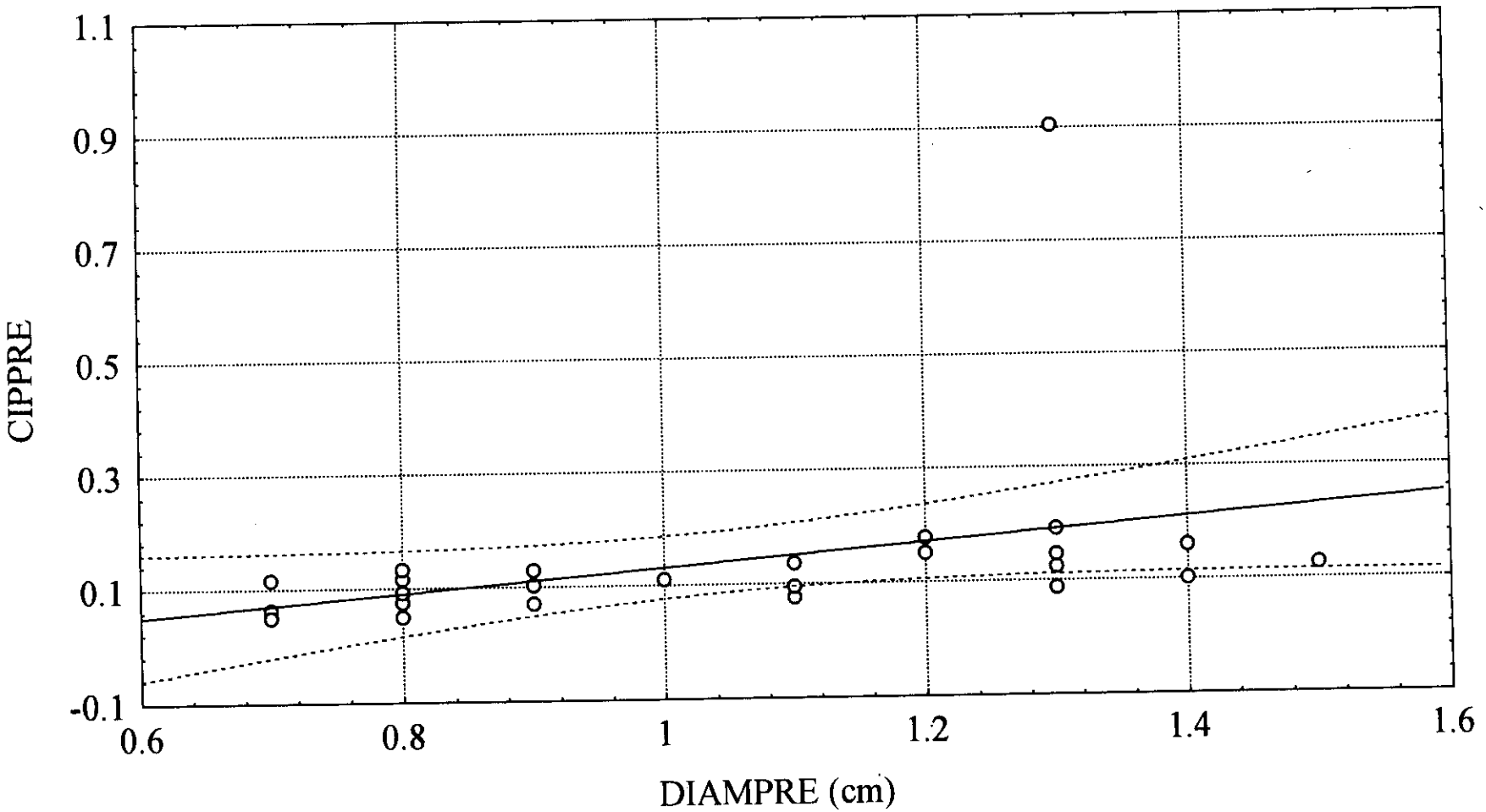
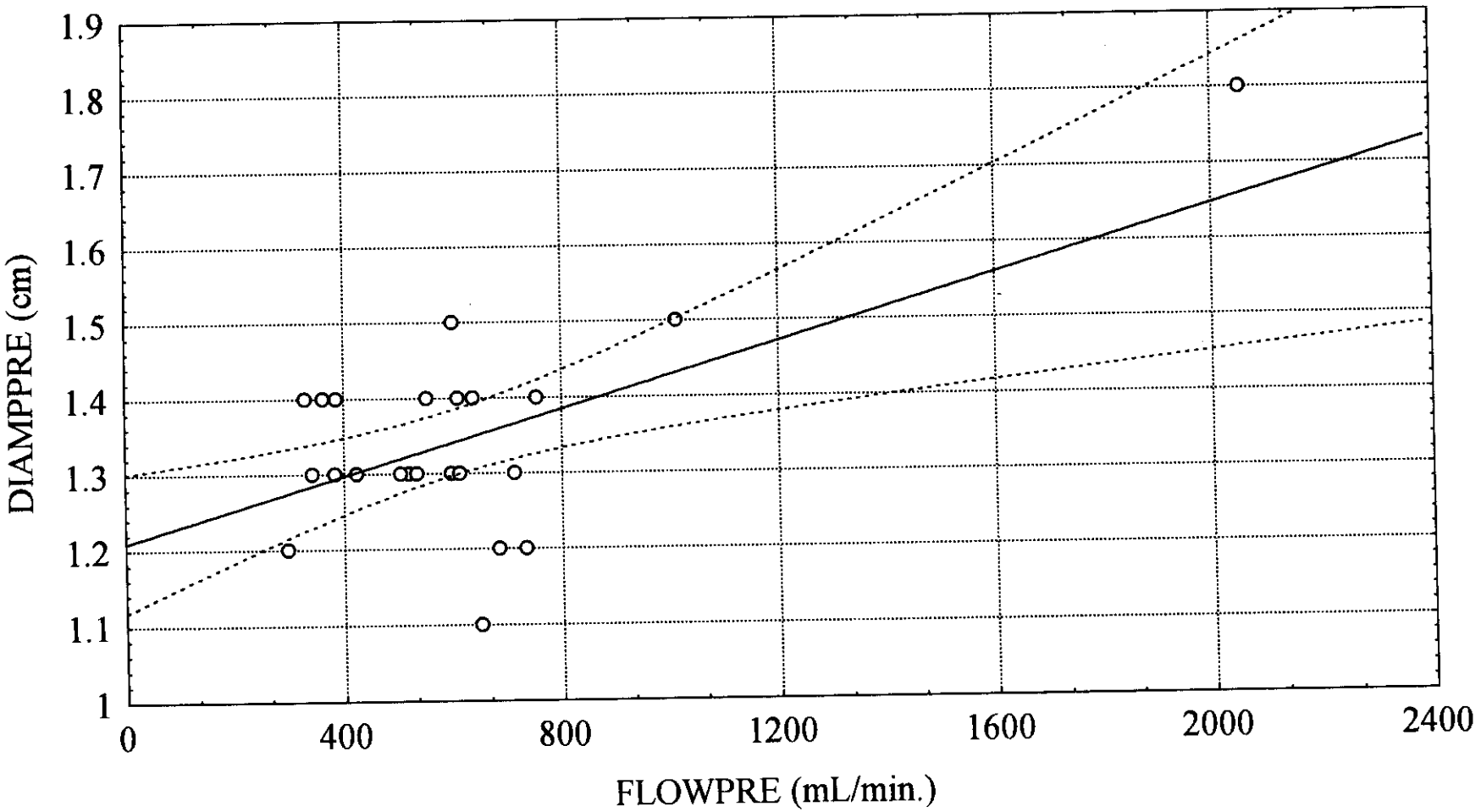


Fig.(36):Correlation between the volume blood flow of the splenic vein and the diameter of the portal vein before the operation



Statistical correlation was done between doppler measurments obtained from the portal vein after the operation and those obtained from the splenic vein before the operation. This statistical analysis revealed positive statistically significant correlation between the diameter of the splenic vein before the operation and the congestion index of the portal vein after the operation. Also, there is significant positive correlation between the maximum blood velocity in the splenic vein before the operation and the diameter of the portal vein after the operation. Moreover, there is a significant positive correlation between the volume blood flow in the splenic vein before the operation and the diameter of the portal vein after the operation (table 44).

Table (44): Correlation between splenic vein measurments before the operation, and portal vein measurment after the operation.

Preop splenic vein	Relative changes in the portal vein			
	Diameter	Velocity	Flow	C.I.
Diameter	R= 0.031 P= 0.867	R= 0.443 P= 0.014*	R= 0.380 P= 0.038*	R= 0.333 P= 0.072
Velocity	R= 0.094 P= 0.620	R= 0.807 P= 0.001*	R= 0.658 P= 0.0001*	R= 0.467 P= 0.001*
Flow	R= 0.009 P= 0.446	R= 0.194 P= 0.302	R= 0.152 P= 0.420	R= 0.030 P= 0.871
C.I.	R= 0.048 P= 0.606	R= 0.028 P= 0.880	R= 0.003 P= 0.984	R= 0.052 P= 0.785

C.I. = congestion index.
* = significant

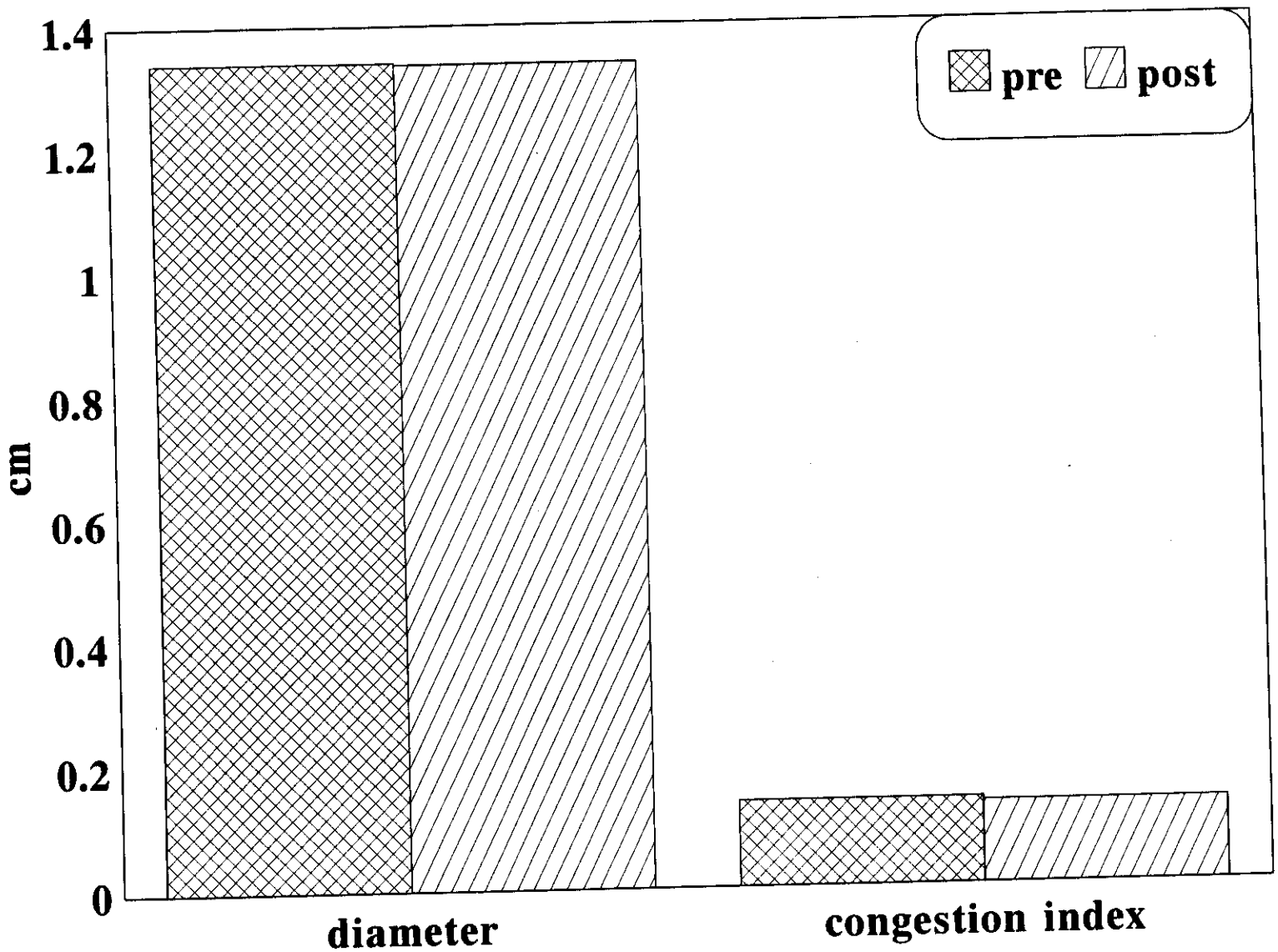


Fig.(37)A comparison between the diameter and congestion index of the portal vein before and after the operation

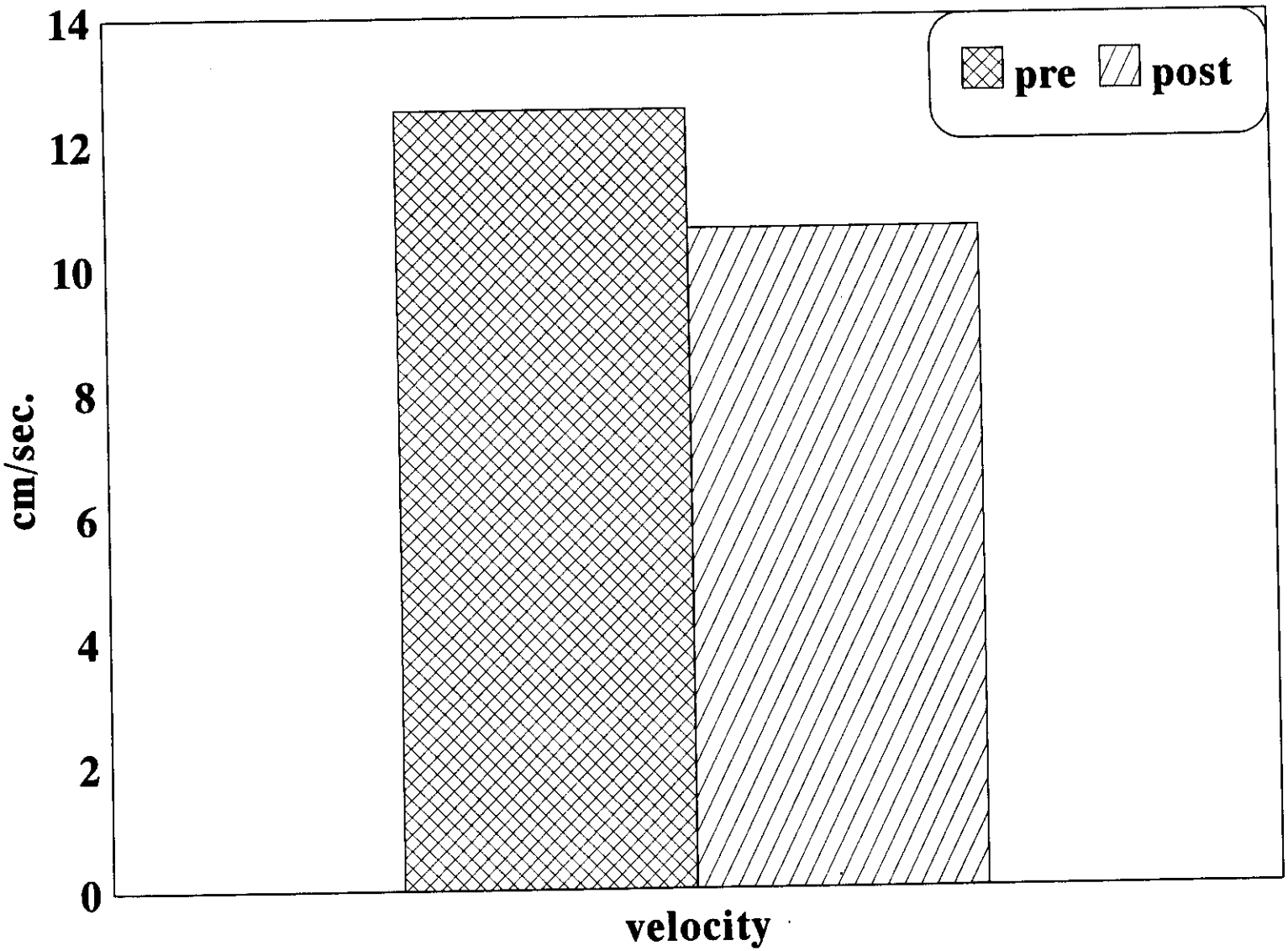


Fig.(38): A comparison between the blood velocity in the portal vein before and after the operation

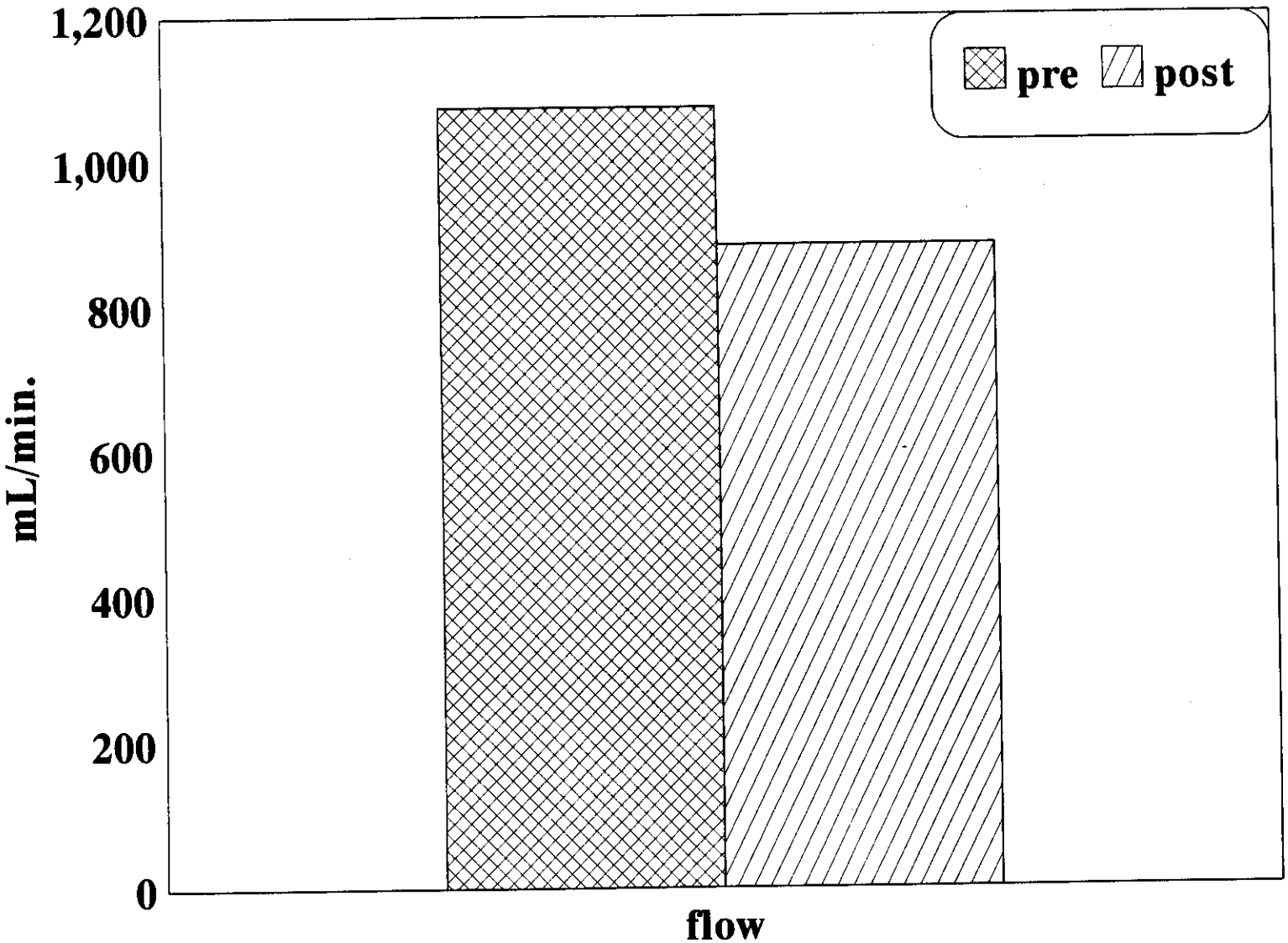


Fig.(39): A comparison between volume of blood flow in the portal vein before and after the operation

Statistical analysis also include correlation between measurments obtained by Doppler scanning of the splenic vein before the operation and the relative changes occurred in the portal vein as a result of splenectomy and devascularization operation. Table (45) shows statistically positive significant correlation between the diameter of the splenic vein before the operation and the relative changes occurred in maximum blood velocity and volume blood flow of the portal vein as a result of the operation. Also, significant positive correlation is noted between the maximum blood velocity in the splenic vein before the operation and the relative changes occurred in maximum blood velocity, volume blood flow and congestion index of the portal vein as a result of the operation.

Table (45): Correlation between splenic vein measurments before the operation and the relative changes occurred in the haemodynamics of the portal vein as a result of the operation.

Preop splenic vein	Postop. Portal vein			
	Diameter	Velocity	Flow	C.I.
Diameter	R= 0.003 P= 0.984	R= 0.210 P= 0.263	R= 0.141 P= 0.457	R= 0.371 P= 0.043*
Velocity	R= 0.542 P= 0.002*	R= 0.097 P= 0.607	R= 0.263 P= 0.176	R= 0.067 P= 0.087
Flow	R= 0.559 P= 0.001*	R= 0.164 P= 0.103	R= 0.269 P= 0.122	R= 0.318 P= 0.087
C.I.	R= 0.275 P= 0.885	R= 0.303 P= 0.103	R= 0.288 P= 0.122	R= 0.140 P= 0.460

C.I. = congestion index
* = significant

We measure the relative changes occurred in the portal vein haemodynimcs from the equation:

$$\frac{\text{post op.measurements - pre op.measurements}}{\text{pre op.measurements}} \times 100$$

then we correlate between the relative changes occurred in the portal vein haemodynamics and all the results obtained from this study.

Statistical correlation was done between age of the patients included in this study and the relative changes occured in the portal vein haemodynamics after the operation. This statistical analysis revealed statistically significant positive correlation between age of the patients and the relative changes occured in the maximum blood velocity of the portal vein after the operation (table 46).

Table (46): Correlation between age and relative changes in portal vein postoperatively.

	Relative changes in the p.v. measurments postop			
	Diameter	Velocity	Flow	Congestion index
R-value	-0.237	0.384	0.240	-0.221
P-value	0.206	0.036*	0.201	0.240

Table (46) show R-value of the correlation between age of the patients and relative changes the occured in the portal vein haemodynamics postoperatively. Estimation of P-value clearly demonstrate that there was a positive statistically significant correlation between age of the patients and the relative changes occured in the maximum blood velocity of the portal vein after the operation ($P < 0.05$).

Statistical analysis of these results revealed no statistically significant difference between both sexes as regard the relative changes occured in the portal vein haemodynamics after splenectomy and devascularization operation (table 47).

Table (47): Relationship between sex of the patients and relative changes occured in the portal vein haemodynamics postoperatively

	Mean (M)	Mean (F)	S.D. (M)	S.D. (F)	t-value	P
Rel. ch. Diameter	-0.248	0.127	4.050	3.763	-0.250	0.803
Rel. ch. Velocity	-14.020	-13.017	18.003	11.711	-0.164	0.870
Rel. ch. Flow	-14.109	-10.956	21.472	18.144	-0.409	0.685
Rel. Ch. C.I.	16.462	19.960	40.240	26.860	-0.256	0.799

Rel.ch. = relative changes
M = male
F = female
C.I = congestion index

Statistical analysis of the obtained results revealed statistically significant difference between patients categorized as Child "A" and patients categorized as Child "B" as regard the relative changes occured in the portal vein maximum blood velocity and volume blood flow after the operation. The mean value of relative changes in the maximum blood velocity of portal

vein in Child "A" patients was -5.203±18.028 where it was -17.877±13.010 in Child "B" patients. This difference is statistically significant as P-value is less than 0.05 . On the other hand, the mean value of relative changes in the volume blood flow of portal vein after the operation in Child "A" patients was -1.889±26.927 where it was -18.485±13.176 in Child "B" patients. This difference is statistically significant ($P < 0.05$) table (48).

Table (48): Comparison between Child "A" and Child "B" patients as regard the relative changes occured in the portal vein postoperatively

	Mean		S.D.		t-value	P
	"A"	"B"	"A"	"B"		
Rel. ch. Diameter	1.048	-0.690	4.870	3.278	1.162	0.254
Rel. ch. Velocity	-5.203	-17.877	18.028	13.010	2.209	0.035*
Rel. ch. Flow	-1.889	-18.485	26.927	13.176	2.287	0.029*
Rel. Ch. C.I.	10.858	21.191	29.167	38.449	-0.746	0.460

Rel.ch. = relative changes.
"A" = Child "A".
"B" = Child "B".
* = significant.

Statistical analysis was done between different complaints of the patients and the relative changes occured in the portal vein after the operation. This statistical analysis revealed that there were no differences between different complaints as regard the relative changes occured in the portal vein haemodynamics after splenectomy and devascularization operation (table 49).

Table (49): Comparison between different complaints as regard relative changes occured in the portal vein postoperatively

	Rel.ch.diameter		Rel.ch. velocity		Rel.ch. flow		Rel.ch. C.I	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Pain	0.201	4.633	11.605	14.308	9.767	21.298	17.432	38.958
Haeviness	0.0	0.0	43.790	0.0	43.706	0.0	80.645	0.0
Easy fatigue	0.0	0.0	48.32	0.0	48.345	0.0	43.650	0.0
Swelling	1.4	3.194	4.879	14.292	7.674	14.159	3.234	24.220
Haematemesis	0.0	0.0	16.539	5.336	16.551	5.358	5.155	25.344
Melena	0.0	0.0	22.549	0.0	22.555	0.0	29.565	0.0
All groups	0.110	3.885	13.652	15.770	12.953	20.052	17.747	35.456
P-value	0.996		0.072		0.373		0.595	

Rel.ch. = relative changes.

Statistical analysis revealed that there is no statisticaly significant difference between cases with past history of jaundice and cases without past history of jaundice as regard the relative changes occured in the portal vein haemodynamics after the operation (table 50).

Table (50): Relation between the presence of past history of jaundice and the relative changes occured in the portal vein haemodynamics after the operation.

	Mean		S.D.		t-value	P
	+ Ve	- Ve	+ Ve	- Ve		
Rel. ch. Diameter	-0.476	0.209	3.503	4.280	-0.475	0.638
Rel. ch. Velocity	-19.491	-8.543	13.015	16.563	-1.991	0.562
Rel. ch. Flow	-19.341	-7.363	14.222	23.035	-1.683	0.103
Rel. Ch. C.I.	16.860	18.523	38.144	34.177	-0.125	0.900

+ Ve= Past history of jaundice
- Ve= No past history of jaundice

Statistical analysis was done to clarify the relation between the presence of past history of Bilharziasis and the relative changes occured in the portal vein haemodynamics postoperatively. This statistical operations revealed that there is no statistically significant difference between cases with past history of Bilharzial infestation and those without past history of Bilharzial infestation regarding the relative changes occured in the portal vein haemodynamics after splenectomy and devascularization operation (table 51).

Table (51): Relation between past history of Bilharziasis and the relative changes occured in the portal vein haemodynamics after the operation.

	Mean		S.D.		t-value	P
	+ Ve	- Ve	+ Ve	- Ve		
Rel. ch. Diameter	0.522	-1.854	3.916	3.436	1.514	0.141
Rel. ch. Velocity	-13.967	-12.789	17.492	10.545	0.177	0.860
Rel. ch. Flow	-11.696	-16.410	23.138	6.404	0.562	0.578
Rel. Ch. C.I.	15.589	23.681	37.714	29.767	0.546	0.589

Rel.ch = relative changes
C.I. = congestion index
+ ve = past history of Bilharziasis
- ve = no past history of Bilharziasis

Statistical analysis was done to demonstrate the relation between the presence of past history of haematemesis and the relative changes occured in the portal vein haemodynamics after the operation. The statistical analysis revealed that there is a difference between cases with past history of haematemesis and cases with no past history of haematemesis regarding the relative changes occured in the diameter and volume blood flow of portal vein after splenectomy and devascularization (table 52).

Table (52): Relation between past history of haematemesis and relative changes occured in the portal vein haemodynamics after the operation

	Rel.ch. diameter		Rel.ch. velocity		Rel.ch. flow		Rel.ch. C.I.	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
- Ve	0.00	3.140	-18.974	10.201	-17.828	12.197	16.430	43.289
+ mild	4.454	6.428	1.633	31.144	14.132	48.823	-6.776	46.009
+ moderate	0.00	0.00	-13.939	15.662	-14.129	15.672	22.169	22.087
++ mild	9.090	0.00	16.666	0.000	40.247	0.00	0.00	0.00
++moderate	-5.375	3.608	-10.865	18.249	-21.012	11.556	27.671	42.158
All groups	-0.110	3.885	-13.652	15.770	-12.953	20.052	17.747	35.456
P-value	0.004*		0.116		0.007*		0.815	

Rel.ch. = relative changes
C.I. = congestion index
* = significant
- Ve = No past history of haematemesis
+ mild = history of one mild attack.
+ moderate = history of one moderate attack.
++ mild = history of two mild attacks.
++ moderate = history of two moderate attacks.

For further statistical analysis of the results, ANOVA test was done between the three variables which appears statistically significantly differ from each other (past history of haematemesis, relative changes in the

diameter, and relative changes in the volume blood flow of portal vein after the operation).

As regard the relative changes in the diameter of the portal vein after the operation, ANOVA test revealed that (Dawson & Trapp, 1990):

1. There is statistically significant difference between, patients with no past history of haematemesis and those with past history of single mild attack of haematemesis. Also, statistical significant difference is found between patients with no past history of haematemesis and those with past history of two mild attacks of haematemesis. Moreover, statistically significant difference is found between patients with no past history of haematemesis and those with past history of two moderate attacks of haematemesis.
2. There are statistically significant differences between patients with past history of single mild attack of haematemsis and patients with past history of single moderate attack, patients with past history of two moderate attacks of haematemesis, and patients with no past history of haematemesis, as regard, the relative changes occured in

the diameter of portal vein after splenectomy and devascularization operation.

3. There are statisticaly significant differences between cases with past history of single moderate attack of haematemesis and cases with past history of single mild attack, cases of past history of two mild attacks, and cases with past history of two moderate attacks of haematemesis, as regard the relative changes occured in the diameter of the portal vein after the operation.

4. There are statistically significant differences between patients with past history of two mild attacks of haematemesis and those with past history single moderate attack, those of past history of two moderate attacks, and those without past history of haematemesis attacks as regard the relative changes occured in the diameter of the portal vein postoperatively.

5. There are statistically significant differences between cases with past history of two moderate attacks of haematemesis and patients with past history of single mild attack, patients with past history of single moderate attack, patients with past history of two mild attacks, and

patients with no past history of haematemesis attacks as regard the relative changes occured in the diameter of the portal vein after the operation.

From the above mentioned results, ANOVA test confirm that the patients studied are different from each other when classified according to their past history of haematemesis as regard the relative changes occured in the portal vein diameter after the operation.

ANOVA test is also done between past history of haematemesis and the relative changes occured in the volume blood flow of the portal vein after the operation, and the following results are obtained:

1. There are statistically significant differences between cases without past history of haematemesis and cases with past history of single mild attack, and the case with past history of two mild attacks of haematemesis as regard the relative changes occured in the volume blood flow of portal vein postoperatively.
2. There are statistically significant differences between patients with past history of single mild attack of haematemesis and patients with

past history of single moderate attack, patients with past history of two moderate attacks, and patients without past history of haematemesis, as regard the relative changes occured in the volume blood flow of portal vein after the operation.

3. There are statistically significant differences between patients with past history of single moderate attack of haematemesis, and patients with past history of single mild attack, and those with past history of two mild attacks of haematemesis, as regard the relative changes occured in the volume blood flow of the portal vein after the operation.

4. There are statistically significant differences between patients with past history of two mild attacks of haematemesis and patients with past history of single moderate attack, patients with past history of two moderate attacks, and those with no past history of haematemesis attacks as regard the relative changes occured in the volume blood flow of portal vein postoperatively.

5. There are statistically significant differences between patients with past history of two moderate attacks of haematemesis and patients

with past history of single mild attack and those with past history of two mild attacks of haematemesis, as regard the relative changes occured in the volume blood flow of portal vein after splenectomy and devascularization operation.

The above mentioned results clarifies that ANOVA test confirm that the patients studied are different from each other when classified according to their past history of haematemesis as regard the relative changes occured in the volume blood flow of the portal vein after the operation of splenectomy and devascularization.

Stastistical analysis was done to demonstrate the relation between the presence of past history of melena and the relative changes occured in the portal vein haemodynamics after the operation. This statistical analysis revealed that there are no differences between patients when classified according to past history of melena, as regard the relative changes occured in portal vein haemodynamics after the operation (table 53).

Table (53): Relation between past history of melena and the relative changes occured in the portal vein haemodynamics after the operation.

	Rel.ch.diameter		Rel.ch. velocity		Rel.ch. flow		Rel.ch. C.I.	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
No	0.00	0.00	22.937	0.00	22.867	0.00	9.375	0.00
+	0.606	2.347	15.998	13.084	14.483	17.816	29.264	29.373
++	0.393	5.175	10.753	19.787	9.616	25.056	1.067	38.040
+++	3.846	5.439	8.818	13.880	16.537	4.243	45.010	30.159
All groups	0.110	3.885	13.652	15.770	12.953	20.052	17.747	35.456
P-value	0.510		0.755		0.879		0.104	

No = no past history of melena
\+ = number of attacks
Rel.ch. = relative changes
C.I. = congestion index

Statistical correlation between past history of injection sclerotherapy for oesophageal varices and relative changes changes occured in the portal vein haemodynamics after the operation revealed statistically negative significant correlation between the relative changes occured in the diameter of the portal vein postoperatively and the presence of past history of

injection sclerotherapy. The R-value is -0.515 and the P-value is < 0.05 table (54).

Table (54): Correlation between relative changes in the haemodynamics of portal vein after the operation and the past history of injection sclerotherapy.

	Rel.ch. in portal vein haemodynamics			
	Diameter	Velocity	Flow	C.I.
R-value	-0.515	-0.097	-0.288	0.152
P-value	0.004*	0.607	0.122	0.422

Rel.ch. = relative changes
C.I. = congestion index
* = significant

Statistical analysis was done to determine the differences between cases in which jaundice was discovered during clinical examination and cases in which clinical examination revealed no discolouration of the sclera as regard the relative changes occured in portal vein haemodynamics after the operation. The statistical analysis revealed differences between the two

groups of patients (group "A" with clinical jaundice and group "B" without clinical jaundice), as regard the relative changes occured in the maximum blood velocity of portal vein after the operation (table 55).

Table (55): ***Differences between jaundiced and non-jaundiced patients as regard the relative changes in the haemodynamics of portal vein after the operation***

	Mean (+)	*Mean (-)*	*S.D. (+)*	*S.D. (-)*	*t-value*	*P*
Rel.ch. diameter	0.00	0.123	0.00	4.103	0.051	0.959
Rel.ch. velocity	-32.733	-11.532	14.031	14.682	-2.379	0.024*
Rel.ch. Flow	-32.754	-10.753	14.034	19.571	1.880	0.705
Rel.ch. C.I.	54.314	13.684	30.516	34.046	1.974	0.058

Rel.ch. = relative changes
C.I. = congestion index
(+) = clinically jaundiced cases
(-) = clinically not jaundiced cases
* = significant

Statistical analysis of the results revealed that patients classified as anaemic cases by clinical examination were different from patients in which pallor was not obvious during routine preoperative clinical examination, as regard the relative changes occured in the congestion index of portal vein after the operation (table 56).

Table (56): Differences between clinicaly anaemic patients and those with no obvious pallor as regard relative changes in the haemodynamics of portal vein postoperatively.

	Mean (+)	*Mean (-)*	*S.D. (+)*	*S.D. (-)*	*t-value*	*P*
Rel.ch. diameter	0.670	1.282	4.282	2.994	1.368	0.182
Rel.ch. velocity	-9.124	-20.445	15.299	14.492	2.026	0.052
Rel.ch. flow	-7.150	-21.657	22.053	13.062	2.044	0.050
Rel.ch. C.I.	6.213	35.048	34.571	30.380	-2.245	0.026*

Rel.ch. = relative changes
C.I. = congestion index
(+) = Clinicaly anaemic
(-) = No clinical pallor

Statistical analysis revealed that there were no differences between cases in which oedema of both lower limbs was discovered during preoperative clinical assessment and cases in which there were no oedema of both lower limbs as regard the relative changes occured in the portal vein haemodynamics after the operation (table 57).

*Table (57): **Differences between cases with oedema of lower limb and cases without oedema of lower limb as regard relative changes in the haemodynamics of portal vein postoperatively.***

	Mean (+)	*Mean (-)*	*S.D. (+)*	*S.D. (-)*	*t-value*	*P*
Rel.ch. diameter	0.00	0.132	0.00	4.271	0.068	0.945
Rel.ch. velocity	-19.513	-12.480	10.818	16.505	-0.907	0.371
Rel.ch. flow	-19.562	-11.631	10.874	21.336	-0.802	0.429
Rel.ch. C.I.	22.590	16.778	23.954	37.650	0.329	0.744

Rel.ch. = relative changes
C.I. = congestion index
(+) = oedema of lower limb
(-) = No oedema of lower limb

Statistical analysis revealed that the mean value of relative changes in the diameter of portal vein after the operation in patients with shrunken liver was 2.389 ± 5.263 while it was 0.865 ± 2.734 in patients with hepatomegaly. The t-value is -2.243 and the p-value is < 0.05. This means that the patients with hepatomegaly differ from patients with shrunken liver as regard the relative changes occured in the diameter of portal vein after the operation (table 58).

Table (58): ***Relation between the size of the liver and the relative changes in the haemodynamics of portal vein postoperatively***

	Mean (+)	*Mean (-)*	*S.D. (+)*	*S.D. (-)*	*t-value*	*P*
Rel.ch. diameter	0.865	-2.389	2.734	5.263	-2.243	0.032*
Rel.ch. velocity	-14.593	-11.457	17.341	11.915	0.492	0.626
Rel.ch. flow	-12.356	-14.346	22.883	12.054	0.245	0.808
Rel.ch. C.I.	21.984	7.945	31.267	44.256	-0.991	0.330

Rel.ch. = relative changes
C.I. = congestion index
(+) = mild hepatomegaly
(-) = shrunken liver
* = significant

Statistical analysis revealed that the mean value of relative hanges in maximum blood velocity of portal vein after the operation in patients with severe splenomegaly (+++) is -20.511±11.588, while it was -8.408±16.811 in patients with gross splenomegaly (++++). The difference between the two groups is statisticaly significant ($P < 0.05$).

Statistical analysis also revealed that the mean value of relative changes in volume blood flow of portal vein after the operation in patients with severe splenomegaly (+++) is -21.443±10.973, while it was -6.460±23.132 in patients with gross splenomegaly (++++). The difference between the two groups is statisticaly significant ($P < 0.05$).

This means that patients with severe splenomegaly are different from patients with gross splenomegaly as regard the relative changes occured in the maximum blood velocity and volume blood flow of portal vein after the operation (table 59).

Table (59): Relation between the size of the spleen and relative changes in the haemodynamics of portal vein postoperatively.

	Mean "A"	Mean "B"	S.D. "A"	S.D. "B"	t-value	P
Rel.ch. diam.	0.512	0.196	1.849	4.957	0.489	0.628
Rel.ch. velo.	-20.511	-8.408	11.588	16.811	2.219	0.034*
Rel.ch. flow	-21.443	-6.460	10.973	23.132	2.151	0.040*
Rel.ch. C.I.	31.142	7.504	31.368	35.823	-1.887	0.069

Rel.ch. = relative changes
C.I. = congestion index
"A" = severe splenomegaly
"B" = gross splenomegaly
* = significant

Statistical analysis revealed that there are no differences between patient with clinical ascites and patients in which ascites was not detected during clinical examination as regard the relative changes occured in the portal vein haemodynamics after the operation (table 60).

Table (60): Relation between ascites as clinical finding and relative changes in the portal vein haemodynamics after the operation.

	Mean (+)	Mean (-)	S.D. (+)	S.D. (-)	T-value	P
Rel.ch. diameter	0.00	0.114	0.00	3.954	0.028	0.977
Rel.ch. velocity	-15.457	-13.590	0.00	16.045	-0.114	0.909
Rel.ch. Flow	-15.463	-12.866	0.00	20.401	-0.125	0.901
Rel.ch. C.I.	15.294	17.832	0.00	36.080	-0.069	0.945

(+) = ascites
(-) = No ascites
Rel.ch. = relative changes
C.I. = congestion index

Statistical analysis revealed that there are no differences between cases with collateral circulation on the anterior abdominal wall, and cases in which there were no collateral circulation on the anterior abdominal wall as regard relative changes occured in portal vein haemodynamics after the operation (table 61).

Table (61): Relation between the presence of collateral circulation on the anterior abdominal wall and relative changes in the haemodynamics of portal vein after the operation.

	Mean (+)	Mean (-)	S.D. (+)	S.D. (-)	T-value	P
Rel.ch. diameter	2.272	-0.477	4.545	3.740	-1.335	0.192
Rel.ch. velocity	-2.303	-15.398	25.174	13.735	-1.585	0.123
Rel.ch. Flow	3.942	-15.552	34.968	16.339	-1.888	0.069
Rel.ch. C.I.	16.174	17.989	57.199	32.637	0.093	0.926

Rel.ch. = relative changes
C.I. = congestion index
(+) = dilated veins on the anterior abdominal wall
(-) = No dilated veins on the anterior abdominal wall

Statistical analysis revealed that there are no differences between cases with ingiunal hernia, cases with umblical hernia, and cases without any type of hernia as regard the relative changes in the portal vein haemodynamics after the operation (table 62).

Table (62): Difference between patients with ingiunal hernia, patients with umblical hernia, and patient without hernia as regard the relative changes occured in portal vein haemodynamics after the operation.

	Rel.ch. diameter		Rel.ch. velocity		Rel.ch. flow		Rel.ch. C.I.	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
-Ve	0.166	4.192	-13.896	17.499	-12.333	22.735	20.255	38.691
Ingiunal H.	-1.785	3.571	-13.724	10.794	-17.183	5.207	-3.430	17.806
Umblical H.	0.00	0.00	-11.689	7.519	-12.065	7.887	26.755	13.964
All groups	-0.110	3.885	13.652	15.770	-12.953	20.052	17.747	35.456
P-value	0.665		0.976		0.980		0.434	

Rel.ch.= relative changes
- ve = No hernia.
Ing. H.= Inguinal hernia.
Umbl.H.= Umblical hernia

Statistical correlations were done between the results of lab investigations obtained from the patients before the operation and the relative changes occured in the portal vein haemodynamics after the operation. As shown in table (63) there are statistically significant positive correlation between the level of total bilirubin in the serum of the patient preoperatively and the relative changes occured in the maximum blood velocity of the

portal vein after the operation. Also, there are statistically significant positive correlation between preoperative SGOT level and the relative changes occured in the diameter of portal vein after the operation. Table (63) also shows a statistically significant positive correlation between preoperative prothrombin concentration and the relative changes occured in the maximum blood velocity and volume blood flow of portal vein after the operation. Moreover there is a statistically significant positive correlation between blood urea level before the operation and the relative changes occured in the maximum blood velocity of the portal vein after the operation.

Table (63): Correlations between preoperative lab investigations and the relative changes occurred in the portal vein haemodynamic after splenectomy and devascularization operation.

Variable	Rel.ch. diameter	Rel.ch. velocity	Rel.ch. flow	Rel.ch. C.I.
Hb. preop	R= 0.087 P= 0.64	R= 0.208 P= 0.268	R= 0.179 P= 0.344	R= 0.247 P= 0.111
Ht. preop	R= 0.018 P= 0.923	R= 0.176 P= 0.352	R= 0.135 P= 0.476	R= 0.354 P= 0.055
T.L.C preop	R= 0.277 P= 0.923	R= 0.047 P= 0.890	R= 0.020 P= 0.915	R= 0.028 P= 0.466
Plat. preop	R= 0.092 P= 0.626	R= 0.026 P= 0.890	R= 0.020 P= 0.915	R= 0.138 P= 466
T. bil. preop	R= 0.062 P= 0.0744	R= 0.386 *P= 0.035	R= 0.338 P= 0.067	R= 0.325 P= 0.079
D. bil. preop	R= 0.016 P= 0.932	R= 0.179 P= 0.344	R= 0.171 P= 0.366	R= 0.123 P= 0.017
SGOT preop	R= 0.443 P= 0.014*	R= 0.229 P= 0.224	R= 0.349 P= 0.059	R= 0.334 P= 0.067
SGPT preop	R= 0.221 P= 0.239	R= 0.047 P= 0.574	R= 0.085 P= 0.655	R= 0.075 P= 690
Alk.ph. preop	R= 0.047 P= 0.805	R= 0.106 P= 0.574	R= 0.085 P= 0.655	R= 0.093 P= 0.624
Alb. preop	P= 0.237 P= 0.207	R= 0.054 P= 0.776	R= 0.101 P= 0.542	R= 0.144 P= 0.447
Proth. preop	R= 0.48 P= 0.801	R= 0.437* P= 0.016	R= 0.369* P= 0.044	R= 0.127 P= 0.503
Urea preop	R= 0.279 P= 0.135	R= 0.500 P= 0.005*	R= 0.302 P= 0.104	R= 0.174 P= 0.357
Creat. preop	R= 0.067 P= 0.723	R= 0.028 P= 0.879	R= 0.056 P= 0.767	R= 0.065 P= 0.731

* Significant.

Statistical analysis of the obtained results revealed that there are statistically signifiant differences between patients when classified according to the types of hepatitis antibodies discoverd in their serum before the operation as regard the relative changes occured in the maximum blood velocity, volume blood flow and congestion index of the portal vein postoperatively (table 64).

Table (64): ***Relation between the presence of hepatitis markers and relative changes in the portal vein haemodynamics after the operation.***

	Rel.ch. diameter		Rel.ch.velocity		Rel.ch. flow		Rel.ch. C.I.	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
B	-0.549	2.055	-19.867	13.184	-21.019	11.860	31.144	27.191
C	2.081	5.437	-2.283	17.160	3.202	26.507	-9.024	35.087
B & C	-2.051	3.515	-15.841	11.966	-17.590	11.546	13.373	29.281
All groups	-0.110	3.885	-13.652	15.770	-12.953	20.052	17.747	35.460
P-value	0.087		0.024 *		0.009 *		0.004 *	