Results

RESULTS

The present study involved 41 men suffering from varicocele. Their age ranged from 23 to 43 years (mean = 30.7 years). Among the 41 patients, 6 had unilateral (left) varicocele, 35 had bilateral clinical varicocele.

Regarding fertility status, 36 patients were infertile and 5 patients were fertile. The study included also 5 normal fertile age matched control subjects.

Table (7) summaries the data of the semen analysis in different groups. Sperm concentration, grade (a) % motility, grade (a+b) % motility, velocity, linear velocity, percentage of normal sperm forms and concentration of α-glucosidase were found to be significantly lower in the infertile varicocele group compared with the fertile varicocele group and the control group.

Table (7): Semen data of the different groups

Variable	Infertile varicocele group	Fertile varicocele group	Control group
Number of cases	36	5	5
Volume (ml)	3.8 ± 0.3	3.6 ± 0.4	3.8 ± 0.5
Concentration (mil/ml)	27.2 ± 4.3 ***a	75.0 ± 8.5	87.6 ± 10.9
Grade (a) motility (%)	17.9 ± 3.6 *b	39.6 ± 4.4	46.4 ± 7.3
Grade (a+b) motility (%)	35.6 ± 4.7 *b	64.4 ± 3.1	69.2 ± 1.7
Velocity (mm/sec)	20.9 ± 1.6 ***a	34.6 ± 1.9	36.4 ± 1.3
Linear velocity (mm/sec)	18.5 ± 1.5 **a	31.2 ± 1.6	34.0 ± 1.3
Linearity index (%)	85.9 ± 1.7	87.8 ± 2.3	90.4 ± 1.6
Morphology (% normal)	12.3 ± 3 ***a	49.2 ± 4.2	53.2 ± 4.5
Round cells (mill/ml)	2.8 ± 0.3	2 ± 0.3	2 ± 0.4
WBCs (mill/mL)	0.59 ± 0.19	0.38 ± 0.07	0.30 ± 0.15
α-glucosidase (mu/ml)	26.5 ± 2.8 ***a	53 ± 6.4	82.0 ± 5.4
Fructose (mg/dl)	357.8 ± 15.8	376 ± 21.1	428 ± 20.9

Values are experssed as mean ± standard error of mean (SEM).
*** P < 0.001, ** P<0.01, * P<0. 05, compared with the fertile varicocele group.
a = P<0.001, b = P<0.01, c = P<0 .05, compared with the control group.

Table (8) summaries the data of Colour Doppler Ultrasound parameters in the infertile varicocele, fertile varicocele and control groups.

Table (8): Colour Doppler Ultrasound (CDU) parameters in different groups

Groups	Score		Maximum vein diameter		Change of flow velocity	
	Right	Left	Right	Left	Right	Left
Infertile varicocele group (n = 36)	6.6±0.25	8.1±0.2	3.0±0.2	4.0±0.19	7.5±0.51	10.1±0.85
Fertile varicocele group (n = 5)	5.6±0.68	7.6±0.4	2.9±0.52	4.2±0.34	7.2±1.13	10.5±0.95
Control group (n = 5)	1.2±0.37	1±0.45	2.6±24	2.5±0.29	1.8±0.05	1.7±0.07

Values are expressed as mean ± standard error of mean (SEM).

The correlation of the total CDU score (CDU score LT + CDU score RT) with various sperm characteristics are shown in table (9).

Total CDU score is inversely correlated with sperm conentration, grade (a) % motility, grade (a+b) % motility, percentage of normal morphology, velocity, linear velocity and α-glucosidase.

Table (9): Correlation between total Colour Doppler Ultrasound (CDU) score with various sperm characteristics (n = 46)

	Total score	
	r	P
Sperm concentration (mill/ml)	- 0.60	< 0.001
Grade (a) motility (%)	- 0.42	< 0.05
Grade (a + b) motility (%)	- 0.43	< 0.05
Morphology	- 0.64	< 0.001
Velocity	- 0.56	< 0.01
Linear velocity	- 0.57	< 0.01
Linearity index	- 0.19	> 0.05
WBCs	0.21	> 0.05
Fructose	- 0.25	> 0.05
α-glucosidase	- 0.78	< 0.001

r = Correlation coefficien
P = Statistical significance

Table (10) and figures (8,9,10) show the level of testosterone in the peripheral venous blood, internal spermatic vein blood and seminal plasma in the different groups. The testosterone concentrations in the peripheral venous blood, internal spermatic vein blood and seminal plasma were found to be significanly lower in the infertile varicocele group compared with the control group. Also, the testosterone concentration in the internal spermatic vein blood was found to be significantly lower in the infertile varicocele group compared with the fertile varicocele group.

The concentration of testosterone in the internal spermatic vein was found to be 4 times higher than its concentration in the peripheral venous blood in the infertile varicocele group and 6 times higher in the fertile varicocele and control groups. In addition, the conentration of testosterone in the seminal plasma was found to be lower 21 times than its concentration in the peripheral venous blood in the infertile varicocle group, 17 times lower in the fertile varicocele and 18 times lower in the control group.

Table (1[redacted]): Level of testosterone (ng/ml) in differnt groups

Group	[redacted]estosterone in perip[redacted]heral venous blood	testosterone in internal spermatic vein blood	Testosterone in seminal plasma
Infertile varicocele group	5.7 ± 0.3 b (n = 36)	21.2 ± 0.3 ***a (n = 36)	0.31 ± 0.02 b (n = 27)
Fertile varicocele group	6.6 ± 0.3 (n = 5)	41.2 ± 1.9 (n = 5)	0.39 ± 0.03 (n = 5)
Control group	7.7 ± 0.4 (n = 5)	46.8 ± 1.1 (n = 5)	0.43 ± 0.04 (n = 5)

Values are experssed as mean ± stand[redacted]rd error of mean (SEM).
*** P < 0.001, ** P<0.01, * P<0.05, [redacted] compared with the fertile varicocele group.
a = P<0.001, b = P<0.01, c = P<0.05 [redacted] compared with the control group.

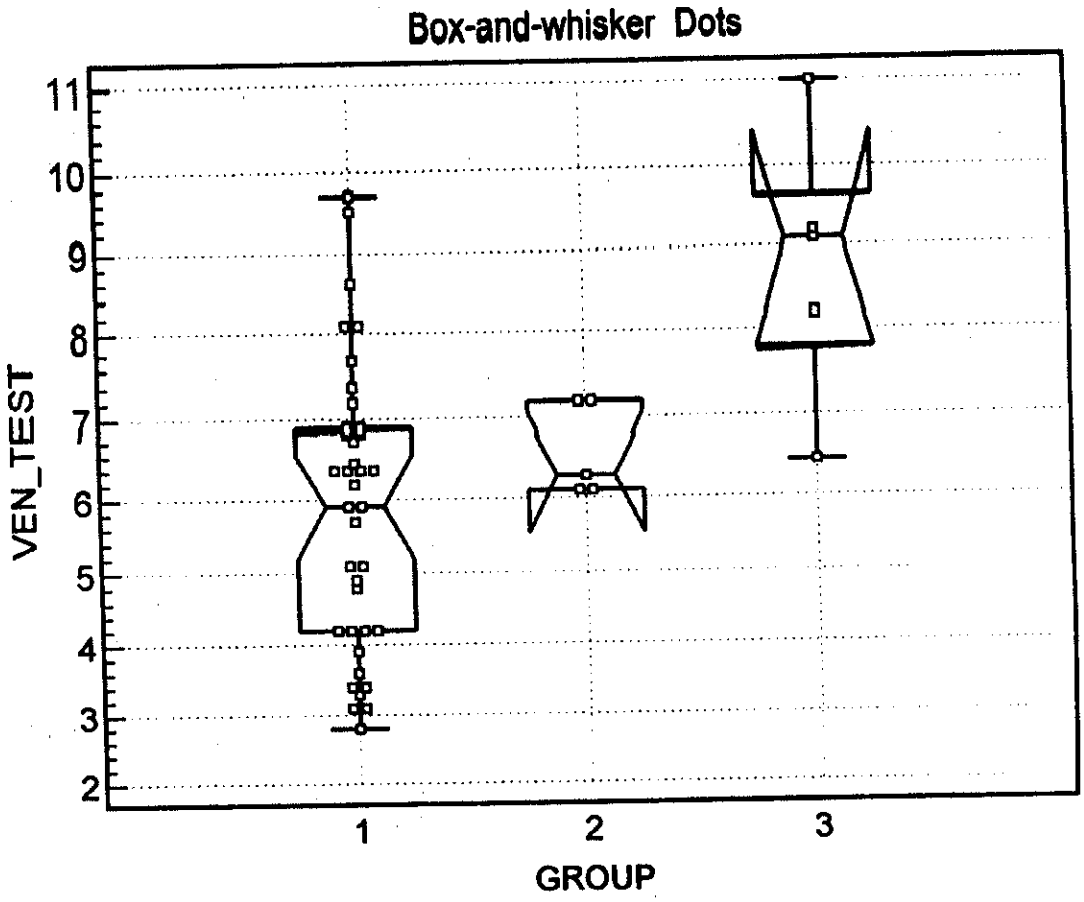

Fig. (8): Notched box-and whisker plots of the testosterone level in the peripheral venous blood in the different groups.
VEN-TEST = Peripheral venous blood testosterone (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

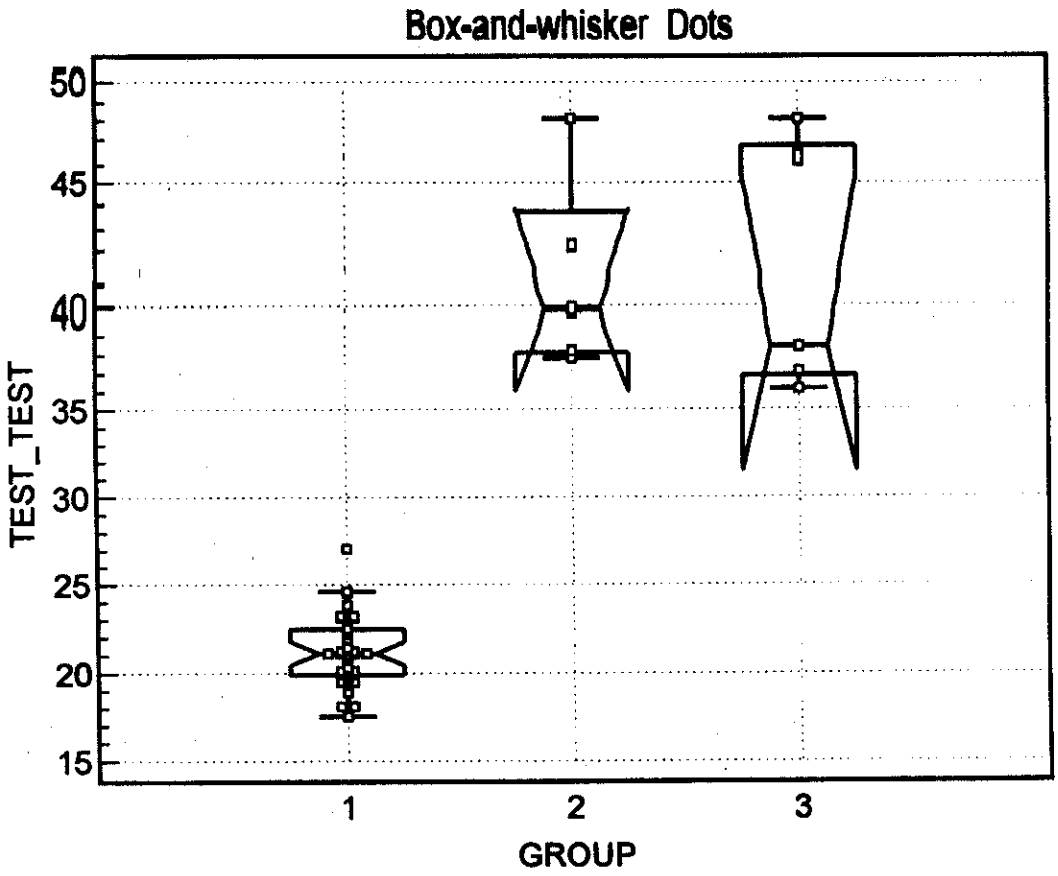

Fig. (9): Notched box-and-whisker plots of the testosterone level in the internal spermatic vein blood in the different groups.
TEST-TEST= Internal spermatic vein testosterone (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

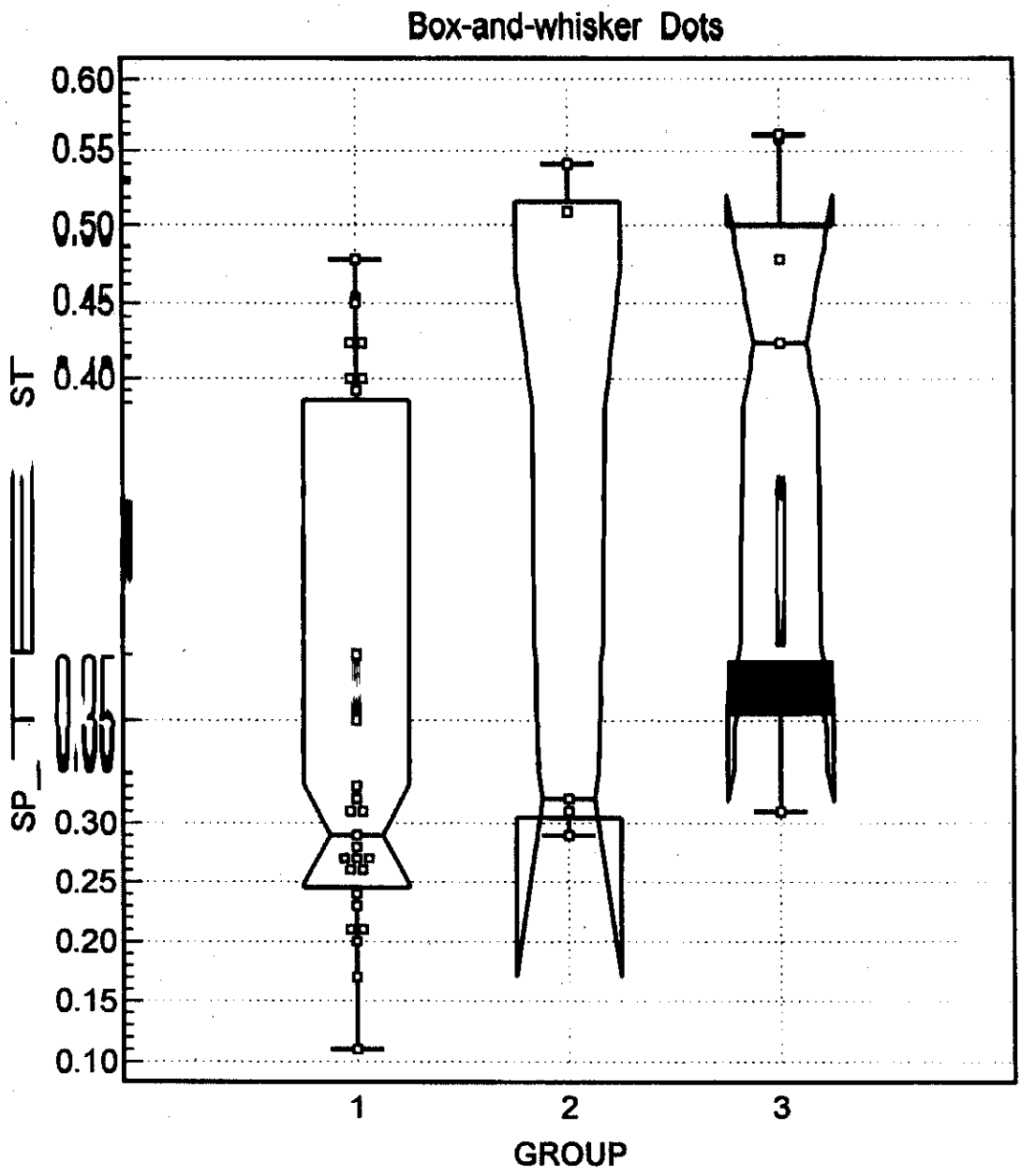

Fig. (10): Notched box-and-whisker plots of the testosterone concentration in the seminal plasma in the different groups.
SP-TEST = Seminal plasma testosterone (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

Table (11) and figures (11,12,13) show the level of DHT in the peripheral venous blood, internal spermatic vein blood and seminal plasma in the different groups. The DHT concentrations in the peripheral venous blood, internal spermatic vein blood and seminal plasma were found to be significanly lower in the infertile varicocele group compared with the control group. Also, the DHT concentration in the internal spermatic vein blood and the seminal plasma were found to be significantly lower in the infertile varicocele group compared with the fertile varicocele group.

The concentration of DHT in the internal spematic vein was found to be 9 times higher than its concentration in the peripheral venous blood in the infertile varicocele group and to be 10 times higher in the fertile varicocele and conrol groups.

The concentration of DHT in the seminal plasma was found to be 1.7 times lower than its concentrationin the peripheral venous blood in the infertile varicocele group, 1.3 times lower in the fertile varicocele group and to be 1.4 times lower in the control group.

Table (11): Level of dihydrotestosterone (ng/ml) in different groups

Group	DHT inperipheral venous blood	DHT in internal spermatic vein blood	DHT in seminal plasma
Infertile varicocele group	0.33 ± 0.02 b (n = 36)	2.81± 0.09 *a (n = 36)	0.22 ± 0.02 *b (n = 27)
Fertile varicocele group	0.42 ± 0.01 (n = 5)	4.28 ± 0.18 (n = 5)	0.32 ± 0.02 (n = 5)
Control group	0.48 ± 0.05 (n = 5)	4.70 ± 0.1 (n = 5)	0.34 ± 0.01 (n = 5)

Values are experssed as mean ± standard error of mean (SEM).
*** P < 0.001, ** P<0.01, * P<0.05, compared with the fertile varicocele group.
a = P<0.001, b = P<0.01, c = P<0.05 , compared with the control group.

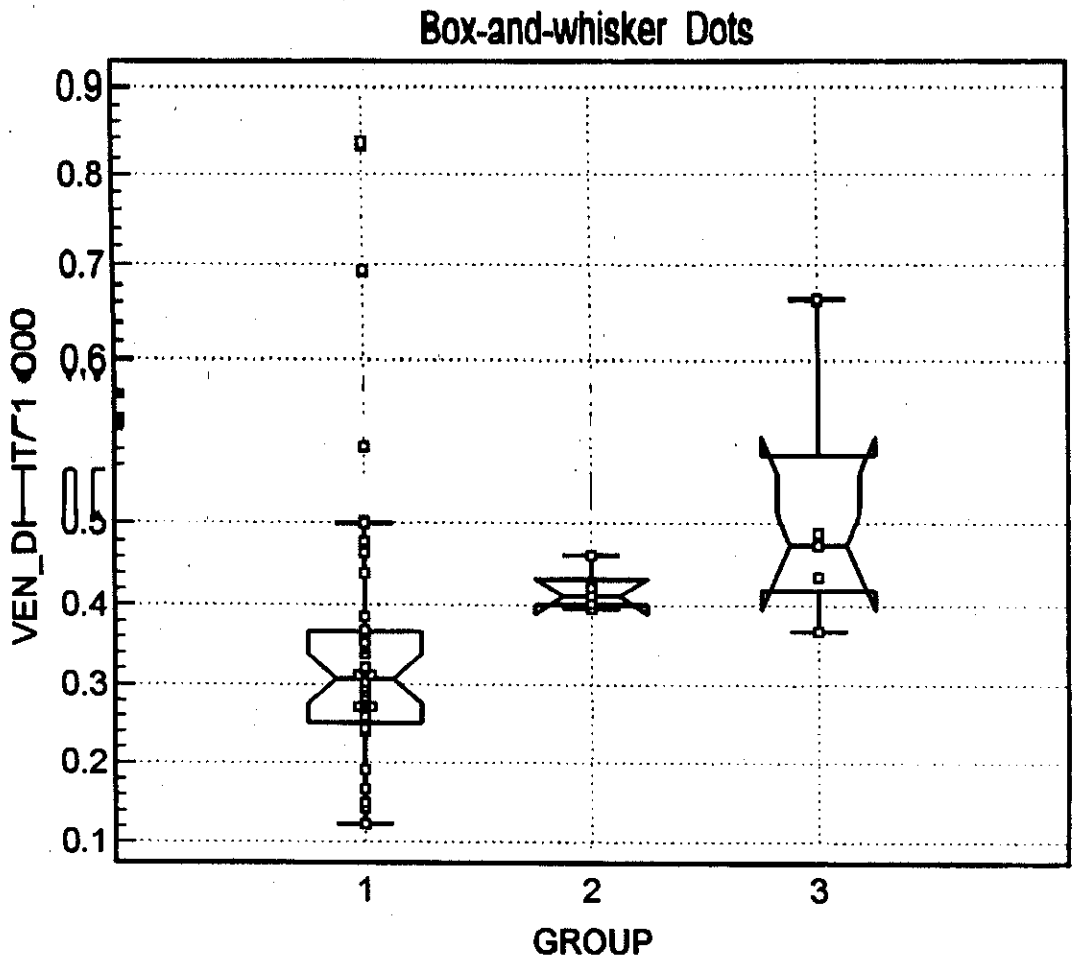

Fig. (11): Notched box-and-whisker plots of the DHT level in the peripheral venous blood in the different groups.
VEN-DHT/1000 = Peripheral venous blood DHT (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

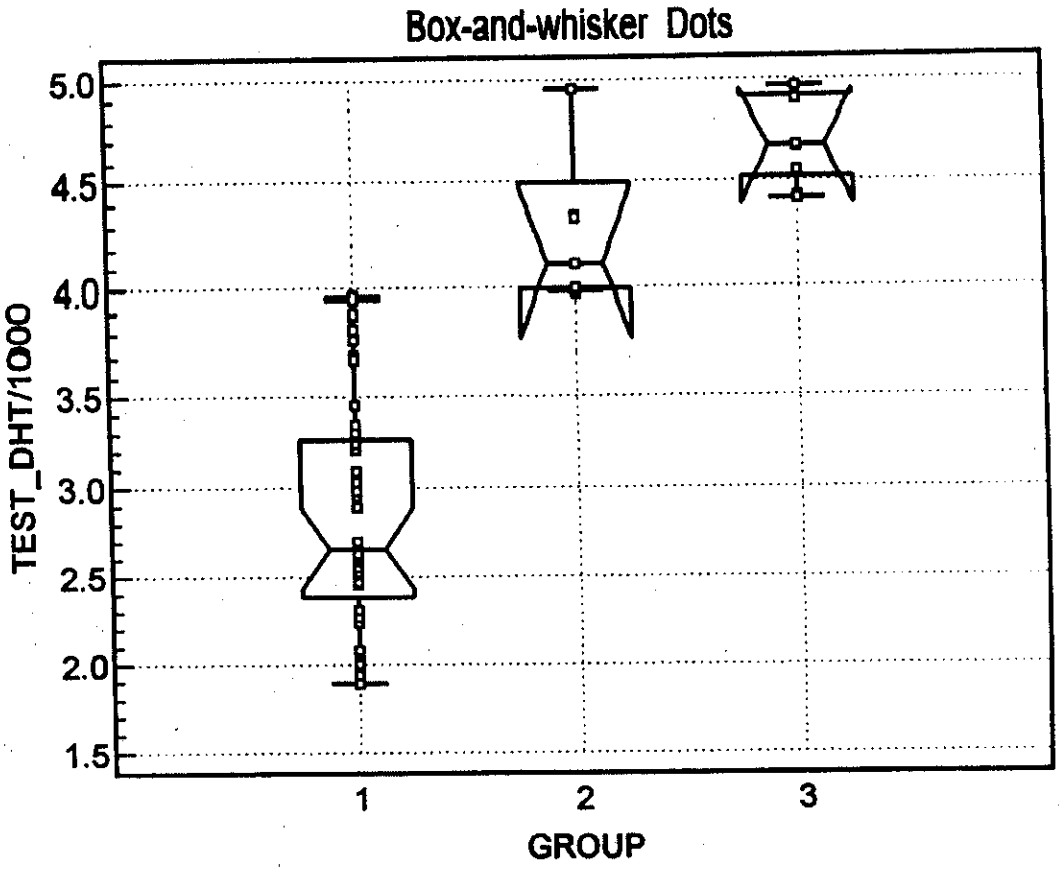

Fig. (12): Notched box-and-whisker plots of the DHT level in the internal spermatic vein blood in the different groups.
TEST-DHT/1000 = Internal spermatic vein DHT (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

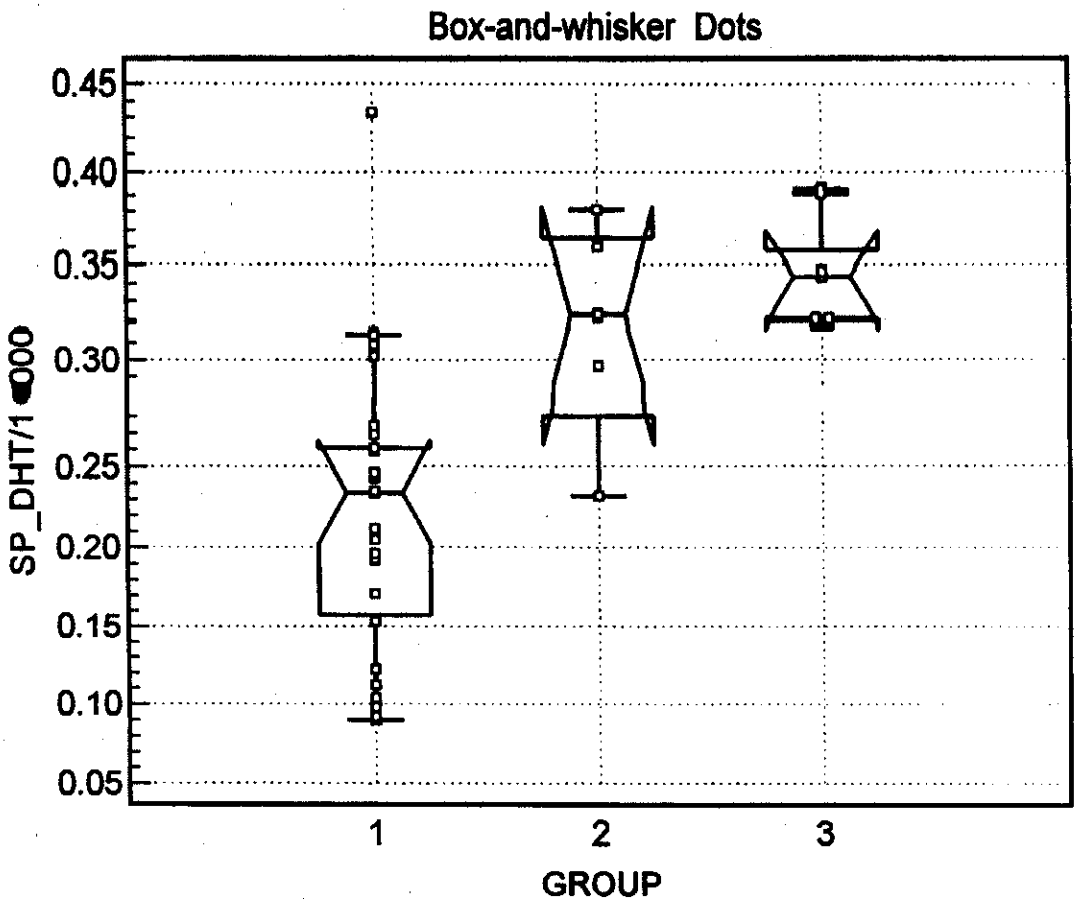

Fig. (13): Notched box-and-whisker plots of the DHT concentration in seminal plasma in the different groups.
SP-DHT/1000 = Seminal plasma DHT (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

Table (12) and figures (14,15,16) show the level of serotonin in the peripheral venous blood, internal spermatic vein blood and seminal plasma in the different groups. The serotonin concentrations in the peripheral venous blood and internal spermatic vein blood were found to be significantly higher in the infertile varicocele group compared with the fertile varicocele group and the control group. However, the concentration of serotonin in the seminal plasma was found to be significantly lower in the infertile varicocele group compared with the fertile varicocele group.

The serotonin concentration in the internal spermatic vein was found to be significantly high than its concentration in the peripheral venous blood ($P<0.001$) in the infertile varicocele group.

Ta ble (12): Level of serotonin (ng/ml) in different groups

Group	Serotonin in peripheral venous blood	Serotonin in internal spermatic vein blood	Serotonin in seminal plasma
Infertile varicocele group	164.4 ± 6.4 ***a (n = 36)	201.6± 6.3 ***a (n = 36)	181.6 ± 18.2 **a (n = 27)
Fertile varicocele group	83.2 ± 5.6 (n = 5)	132.4 ± 7.1 (n = 5)	325.2 ± 26.6 (n = 5)
Control group	83.8 ± 6.2 (n = 5)	118.4 ± 6.3 (n = 5)	356.6 ± 20.5 (n = 5)

Values are experssed as mean ± standard error of mean (SEM).
*** P < 0.001, ** P<0.01, * P<0.05, compared with the fertile varicocele group.
a = P<0.001, b = P<0.01, c = P<0.05, compared with the control group.

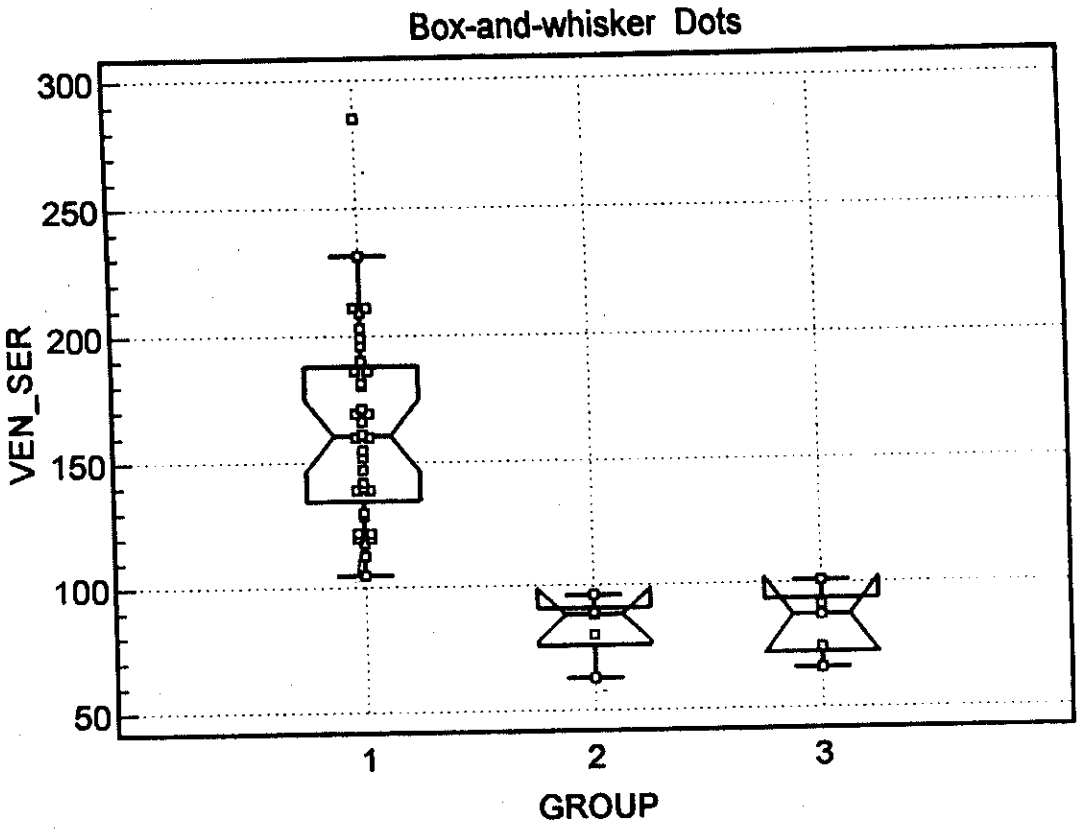

Fig. (14): Notched box-and-whisker plots of the serotonin level in the peripheral venous blood in the different groups.
VEN-SER = Peripheral venous blood serotonin (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

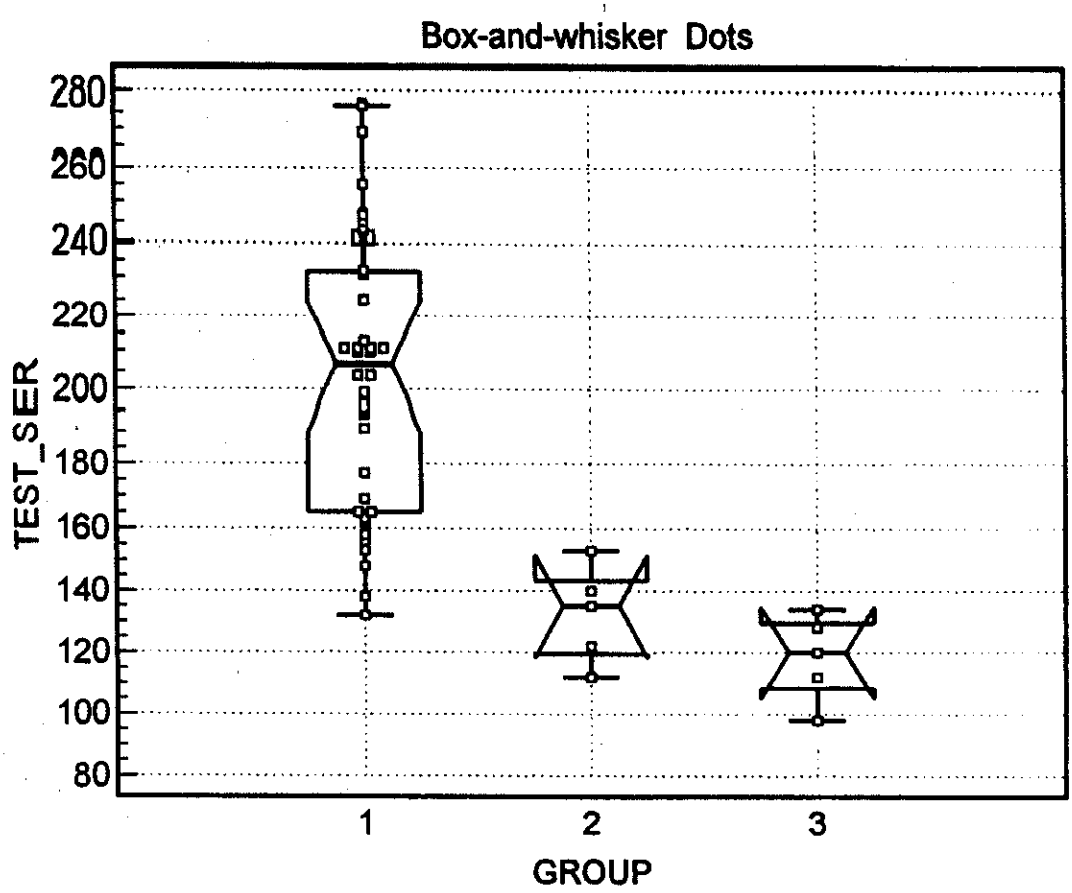

Fig. (15): Notched box-and-whisker plots of the serotonin level in the internal spermatic vein blood in the different groups.
TEST-SER = Internal spermatic vein serotonin (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

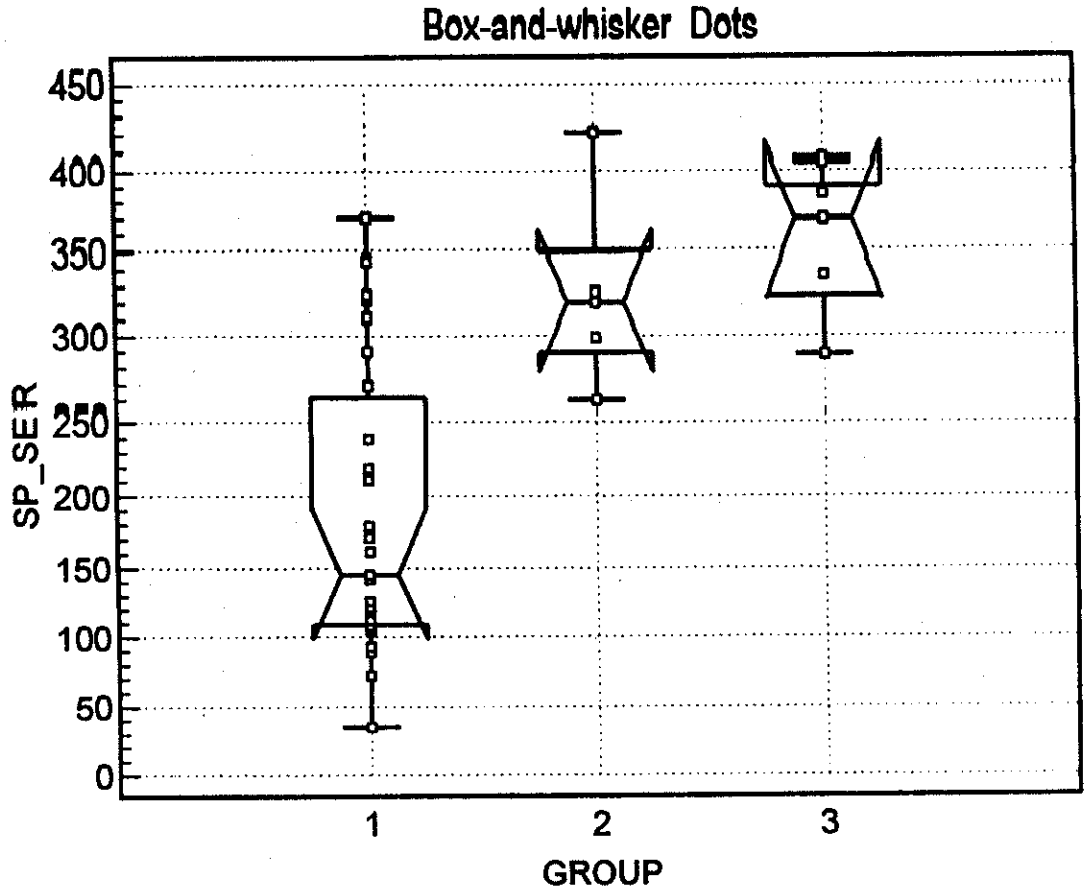

Fig. (16): Notched box-and-whisker plots of the serotonin concentration in the peripheral venous blood in the different groups.
SP-SER = Seminal plasma serotonin (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

Table (13) and figures (17,18,19) show the level of IL-6 in the peripheal venous blood, internal spermatic vein blood and seminal plasma in the different groups. The IL-6 concentrations in the peripheral venous blood, internal spermatic vein blood and seminal plasma were found to be significanly higher in the infertile varicocele group with WBCs <1 mill/ml compared with the fertile varicocele group and the conrol group. IL-6 was found to be significanly higher in patients with WBCs more than 1mill/ml compared with he sampels with WBCs less than 1mill/ml.

Table (13): Level of interleukin-6 (pg/ml) in different groups

Group	IL-6 in peripheral venous blood	IL-6 in internal spermatic vein blood	IL-6 in seminal plasma (WBCs <1 mill/ml)	IL-6 in seminal plasma (WBCs >1 mill/ml)
Infertile varicocele group	8.1 ± 0.4 **c (n = 36)	9.4 ± 0.5 *c (n = 36)	50.9 ± 9.7 **a	474.2 ± 136.2 (n = 4)
Fertile varicocele group	4.9 ± 0.5 (n = 5)	6.6 ± 0.8 (n = 5)	13.3 ± 2.8 (n = 5)	--
Control group	5.6 ± 0.5 (n = 5)	6.7 ± 0.6 (n = 5)	6.0 ± 0.7 (n = 5)	--

Values are experssed as mean ± standard error of mean (SEM).
*** P < 0.001, ** P<0.01, * P<0.05, compared with the fertile varicocele group.
a = P<0.001, b = P<0.01, c = P<0.05, compared with the control group.

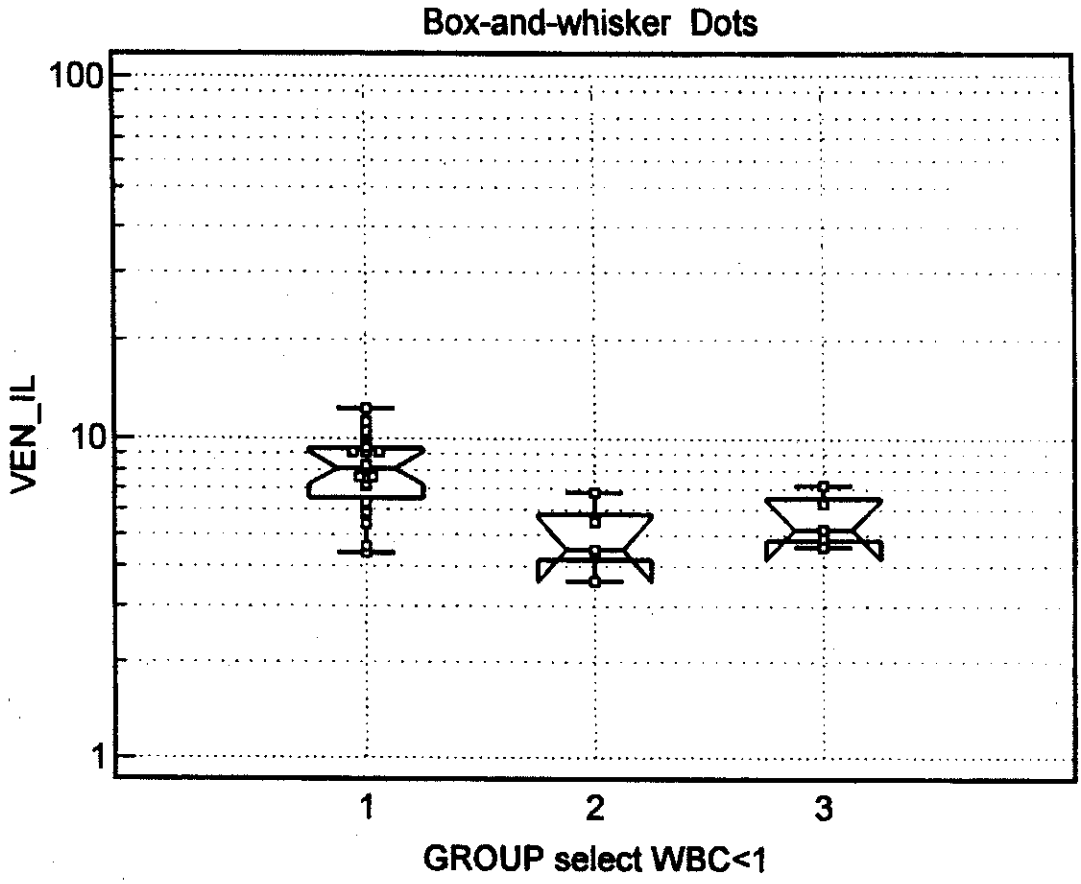

Fig. (17): Notched box-and-whisker plots of the IL-6 level in the peripheral venous blood in the different groups.
VEN-IL = IL-6 in peripheral venous blood (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

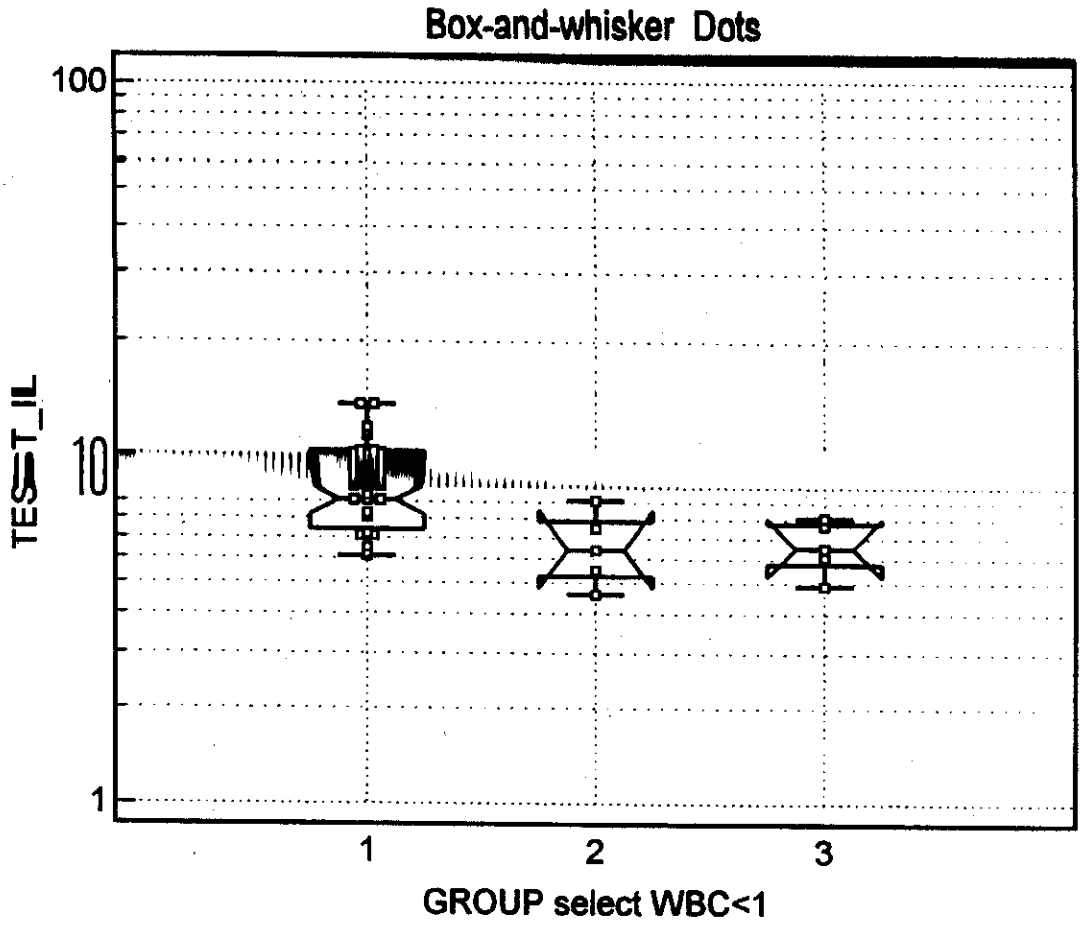

Fig. (18): Notched box-and-whisker plots of the IL-6 level in the internal spermatic vein blood in the different groups.
TEST-IL = Internal spermatic vein IL-6 (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

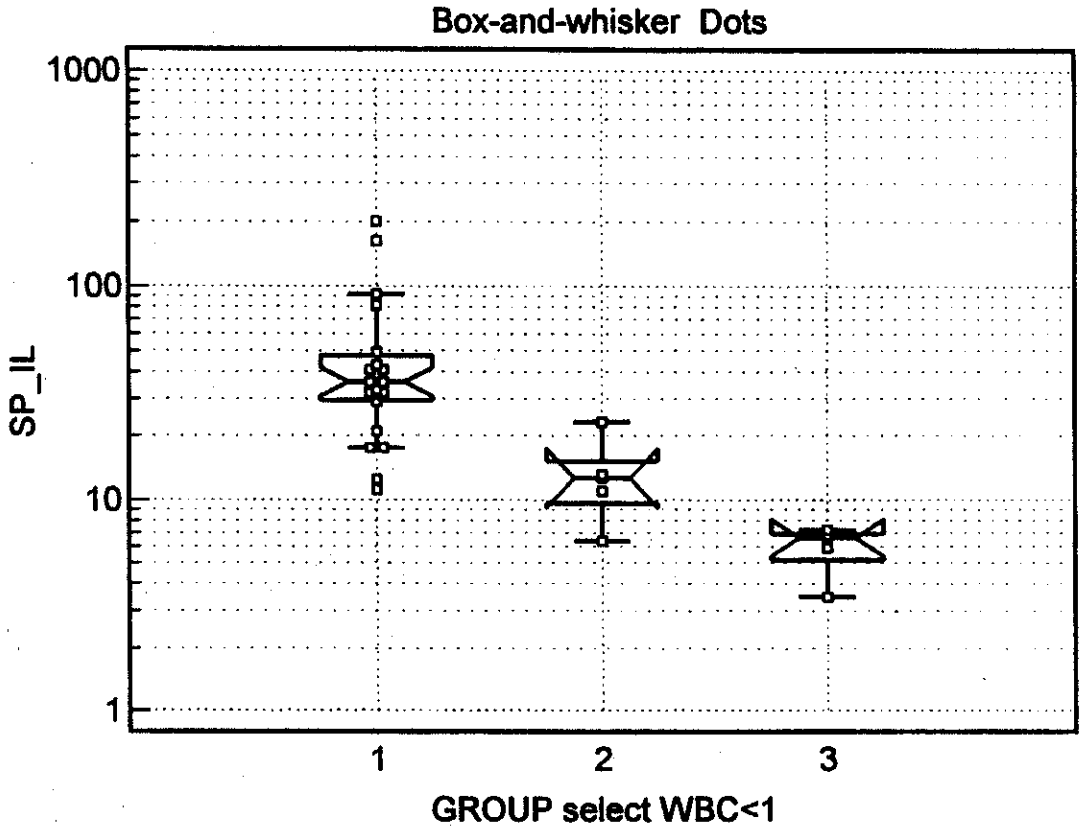

Fig. (19): Notched box-and-whisker plots of the IL-6 concentration in the seminal plasma in the different groups with WBCs <1 mill./ml.
SP-IL = Seminal plasma IL-6 (ng/ml)
1) = Infertile varicocele group.
2) = Fertile varicocele group.
3) = Control group.

The correlation of the peripheral venous blood IL-6, serotonin, DHT and testosterone concentrations with various sperm characteristics and total CDU score are shown in table (14).

IL-6 concentration in the peripheral venous blood was inversely correlated with sperm concentration, percentage of normal morphology, velocity, linear velocity and α-glucosidase, while it was directly correlated with WBCs concentration and total CDU score.

Serotonin concentration in the peripheral venous blood was inversely correlated with sperm concentration (figure 20), grade (a) % motility (figure 21), grade (a+b) % motility, percentage of normal morphology (figure 22), velocity, linear velocity, fructose and α-glucosidase, while it was directly correlated with total CDU score.

DHT concentration in the peripheral venous blood was directly correlated with sperm concentration (figure 23), percentage of normal morphology, velocity, linear velocity and α-glucosidase, while it was inversely correlated with total CDU score.

Testosterone concentration in the peripheral venous blood was directly correlated with sperm concentration (figure 24), grade (a) % motility, grade (a+b) % motility, percentage of normal morphology,

Table (14): Correlations of peripheral venous blood IL-6, serotonin, DHT and testosterone concentrations with various sperm characteristics and total CDU score (n = 46)

Sperm characteristics	IL-6 in peripheral venous blood		Serotonin in peripheral venous blood		DHT in peripheral venous blood		Testosterone in peripheral venous blood	
	r	P	r	P	r	P	r	P
Sperm concentration (mill/mL)	-0.39	<0.05	-0.72	<0.001	0.58	<0.001	0.54	<0.001
Grade (a) motility (%)	-0.27	>0.05	-0.69	<0.001	0.31	>0.05	0.44	<0.01
Grade (a+b) motility (%)	-0.26	>0.05	-0.65	<0.001	0.33	>0.05	0.39	<0.05
Morphology (% normal)	-0.44	<0.01	-0.74	<0.001	0.49	<0.01	0.51	<0.01
Velocity (μm/sec)	-0.34	<0.05	-0.70	<0.001	0.38	<0.05	0.45	<0.01
Linear velocity (μm/sec)	-0.36	<0.05	-0.71	<0.001	0.35	<0.05	0.47	<0.01
Linearity index (%)	-0.07	>0.05	-0.32	>0.05	0.06	>0.05	0.33	>0.05
WBCs (mill/ml)	0.34	<0.05	-0.03	>0.05	-0.09	>0.05	-0.16	>0.05
Fructose (mg/dl)	-0.13	>0.05	-0.38	<0.05	-0.09	>0.61	0.32	>0.05
α-glucosidase (mU/ml)	-0.45	<0.01	-0.61	<0.001	0.46	<0.01	0.56	<0.001
Total colour Doppler score	0.41	<0.05	0.48	<0.01	-0.49	<0.01	-0.46	<0.01

r = correlation coefficient
P = statistical significance

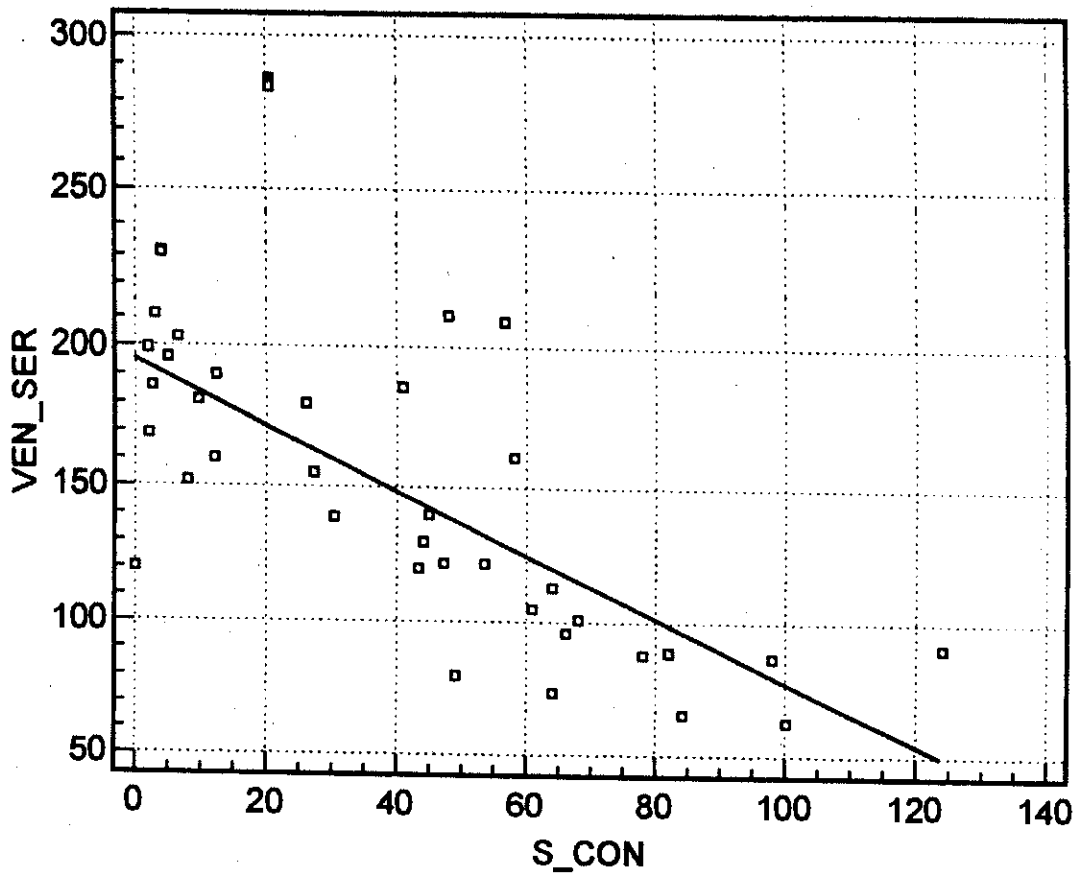

Fig. (20): The correlation between peripheral venous blood concentration of serotonin and sperm concentration (r = -0.72, P<0.0001).

VEN-SER = Peripheral venous blood serotonin (ng/ml)
S-CON = Sperm concentration (mill/mL).

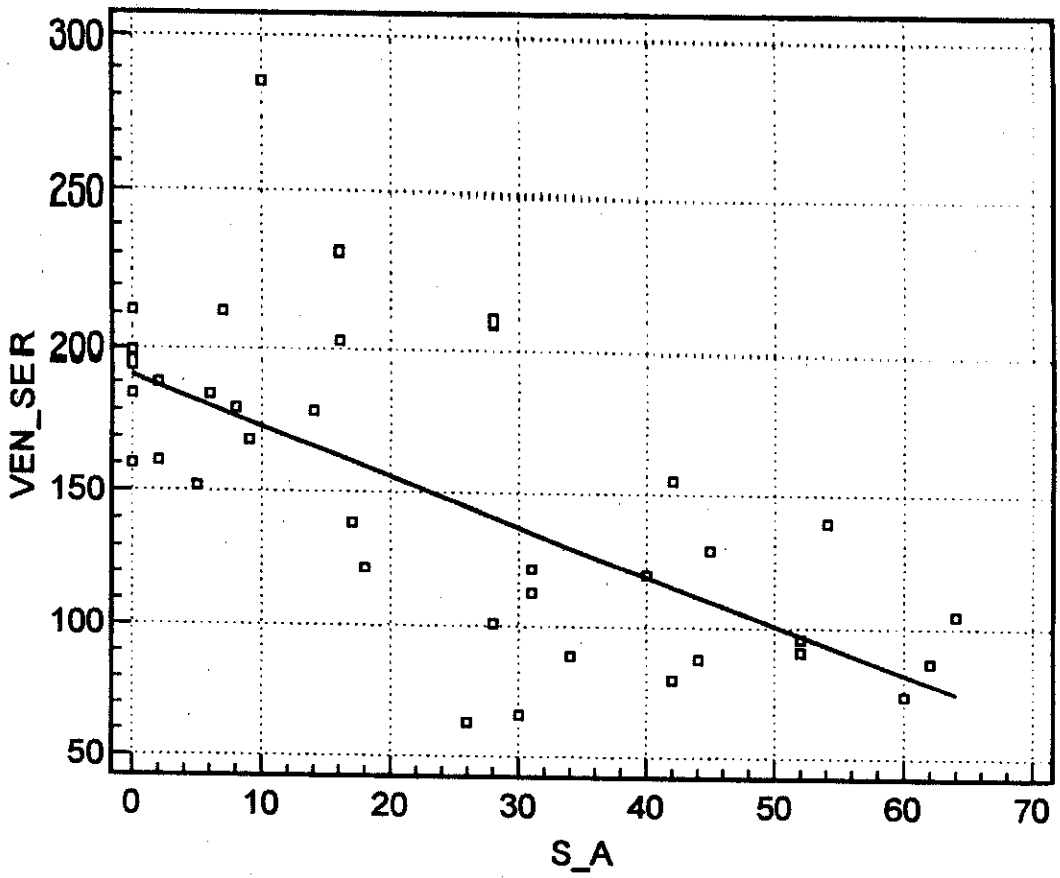

Fig. (21): The correlation between peripheral venous blood concentration of serotonin and grade (a) % motility of sperm ($r = -0.69$, $P<0.001$).

VEN-SER = Peripheral venous blood serotonin (ng/ml)

S-A = Grade (a) motility (%).

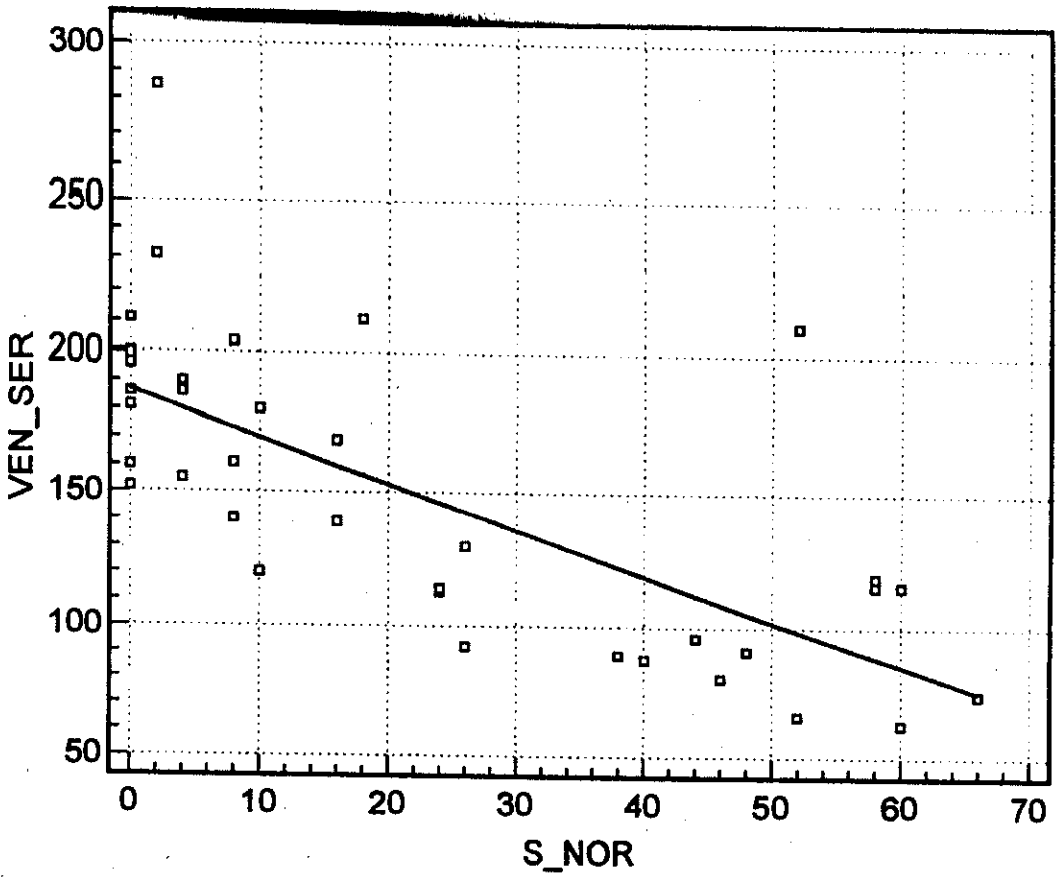

Fig. (22): The correlation between peripheral venous blood concentration of serotonin and percentage of normal morphology ($r = -0.74$, $P<0.0001$).

VEN-SER = Peripheral venous blood serotonin (ng/ml)

S-NOR = Morphology (% normal).

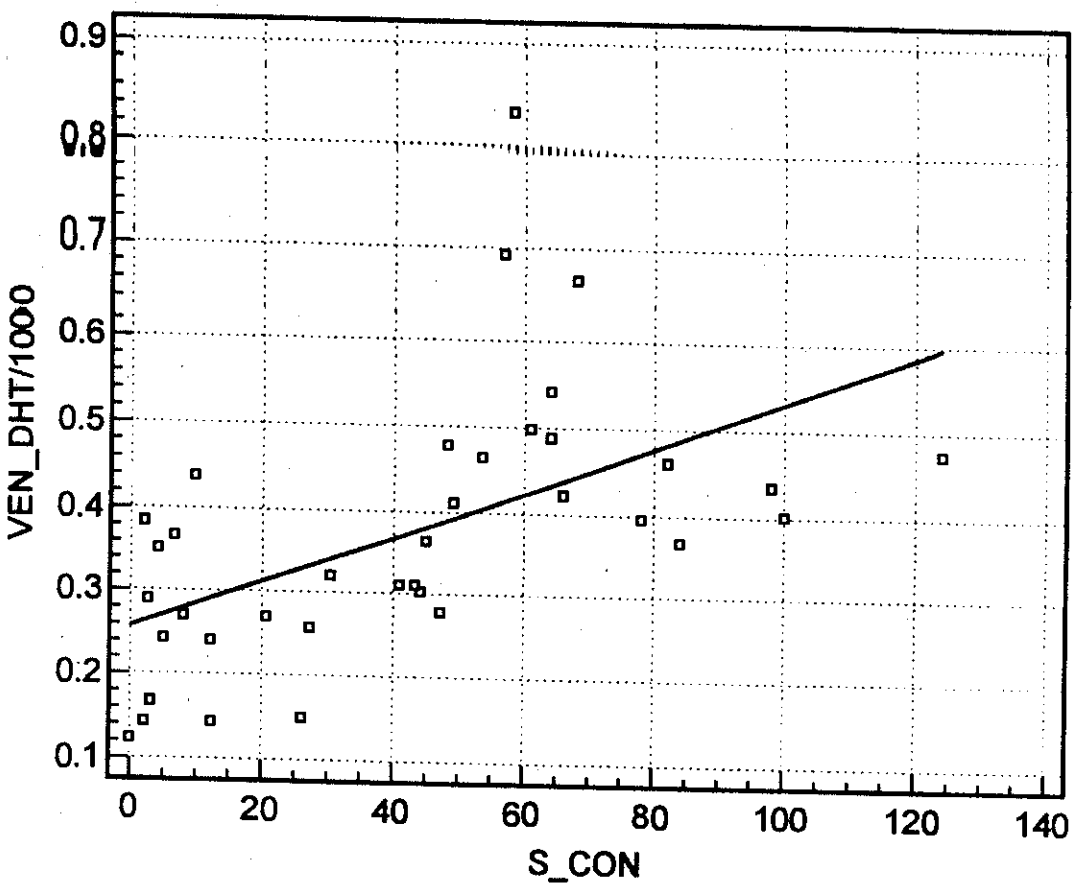

Fig. (23): The correlation between peripheral venous blood concentration of dihydrotestosterone and sperm concentration ($r = 0.58$, $P<0.001$).

VEN-DHT/1000 = Peripheral venous blood DHT (ng/ml)
S-CON = Sperm concentration (mill/mL).

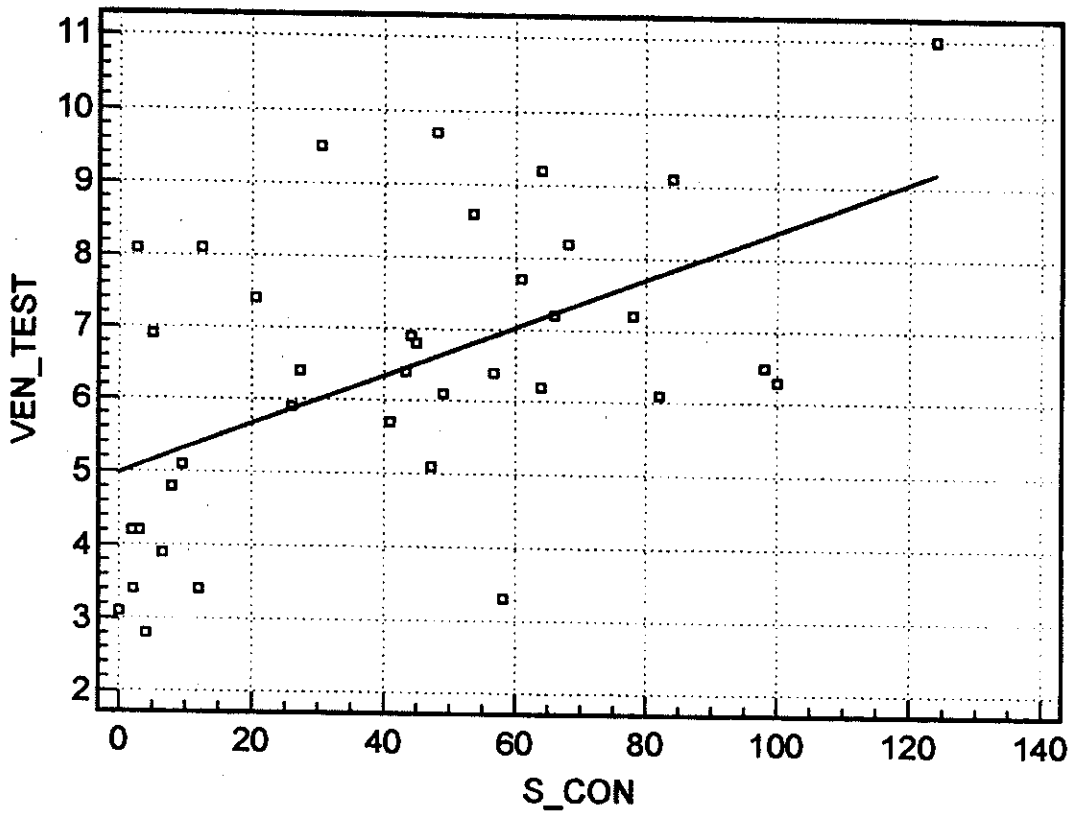

Fig. (24): The correlation between peripheral venous blood concentration of testosterone and sperm concentration (r = 0.54, P<0.001).

VEN-TEST = Peripheral venous blood testosterone (ng/ml)

S-CON = Sperm concentration (mill/mL).

The correlation of the internal spermatic vein blood, IL-6, serotonin, DHT and testosterone concentrations with various sperm characteristics are shown in table (15). IL-6 concentration in the internal spermatic vein blood was inversely correlated with sperm concentration, percentage of normal morphology and α-glucosidase, while it was directly correlated with WBCs concentration. Serotonin concentration in the internal spermatic vein blood was inversely correlated with sperm concentration (figure 25), grade (a) % motility, grade (a+b) % motility, percentage of normal morphology, velocity, linear velocity, linearity index and α-glucosidase, while it was directly correlated with total CDU score. DHT concentration in the internal spermatic vein blood was directly correlated with sperm concentration (figure 26), grade (a) % motility (figure 27), grade (a+b) % motility, percentage of normal morphology, velocity, linear velocity, fructose and α-glucosidase, while it was inversely correlated with total CDU score. Testosterone concentration in the internal spermatic vein blood was directly correlated with sperm concentration, grade (a) % motility, grade (a+b) % motility, percentage of normal morphology (figure 28), velocity, linear velocity and α-glucosidase, while it was inversely correlated with total CDU score.

Table (15): Correlations of internal spermtic vein blood IL-6, serotonin, DHT and testosterone concentrations with various sperm characteristics and total CDU score (N = 46)

Sperm characteristics	IL-6 in internal spermatic vein		Serotonin in internal spermatic vein		DHT in internal spermatic vein		Testosterone in internal spermatic vein	
	r	P	r	P	r	P	r	P
Sperm concentration (mill/mL)	-0.36	<0.05	-0.83	<0.001	0.81	<0.001	0.77	<0.001
Grade (a) motility (%)	-0.29	>0.05	-0.77	<0.001	0.64	<0.001	0.51	<0.001
Grade (a+b) motility (%)	-0.29	>0.05	-0.67	<0.001	0.64	<0.001	0.58	<0.001
Morphology (% normal)	-0.42	<0.05	-0.77	<0.001	0.82	<0.001	0.80	<0.001
Velocity (μm/sec)	-0.28	>0.05	-0.71	<0.001	0.65	<0.001	0.67	<0.001
Linear velocity (μm/sec)	-0.29	>0.05	-0.75	<0.001	0.67	<0.001	0.68	<0.001
Linearity index (%)	-0.01	>0.05	-0.49	<0.01	0.21	>0.05	0.24	>0.05
WBCs (mill/ml)	0.51	<0.01	0.05	>0.05	-0.17	>0.05	-0.16	>0.05
Fructose (mg/dl)	-0.21	>0.05	-0.26	>0.05	0.37	<0.05	0.27	>0.05
α-glucosidase (mU/ml)	-0.39	<0.05	-0.75	<0.001	0.83	<0.001	0.73	<0.001
Total CDU score	0.33	>0.05	0.54	<0.01	-0.69	<0.001	-0.74	<0.001

r = correlation coefficient
P = statistical significance

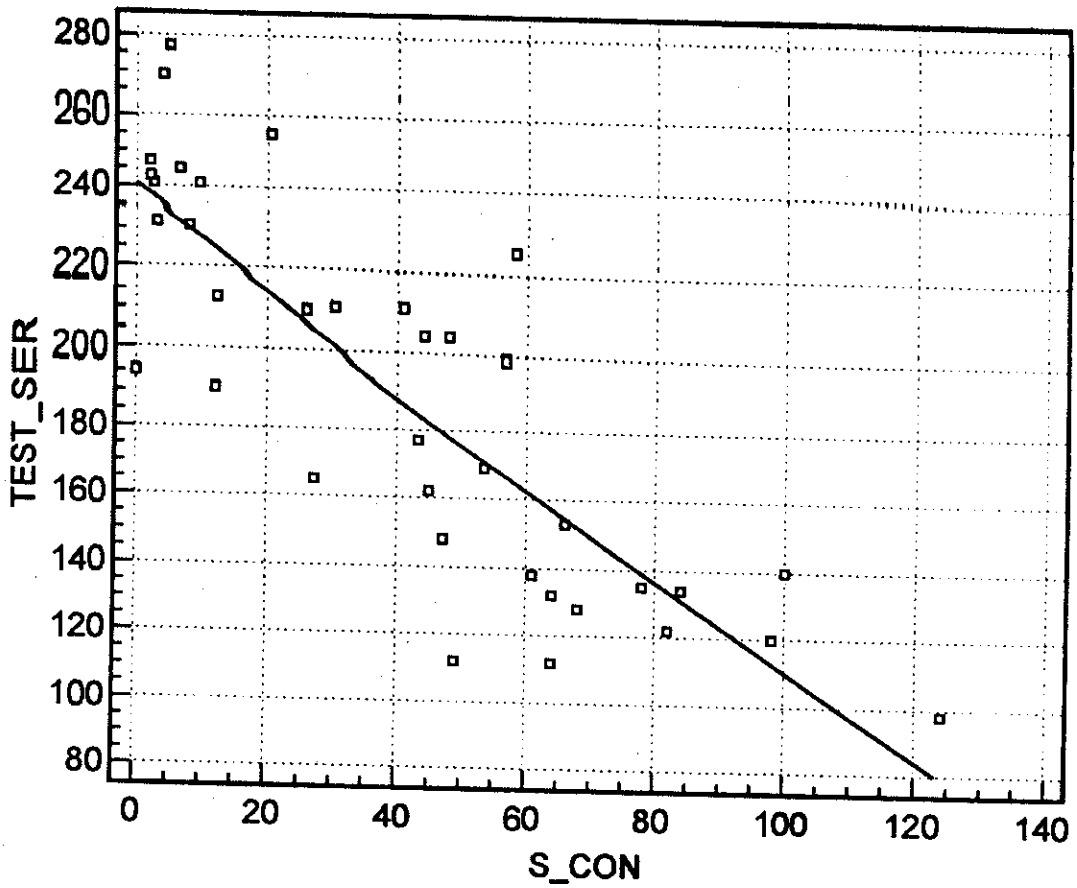

Fig. (25): The correlation between internal spermatic vein concentration of serotonin and sperm concentration ($r = -0.83$, $P<0.001$).
TEST-SER = Internal spermatic vein serotonin (ng/mL)
S-CON = Sperm concentration (mill/mL).

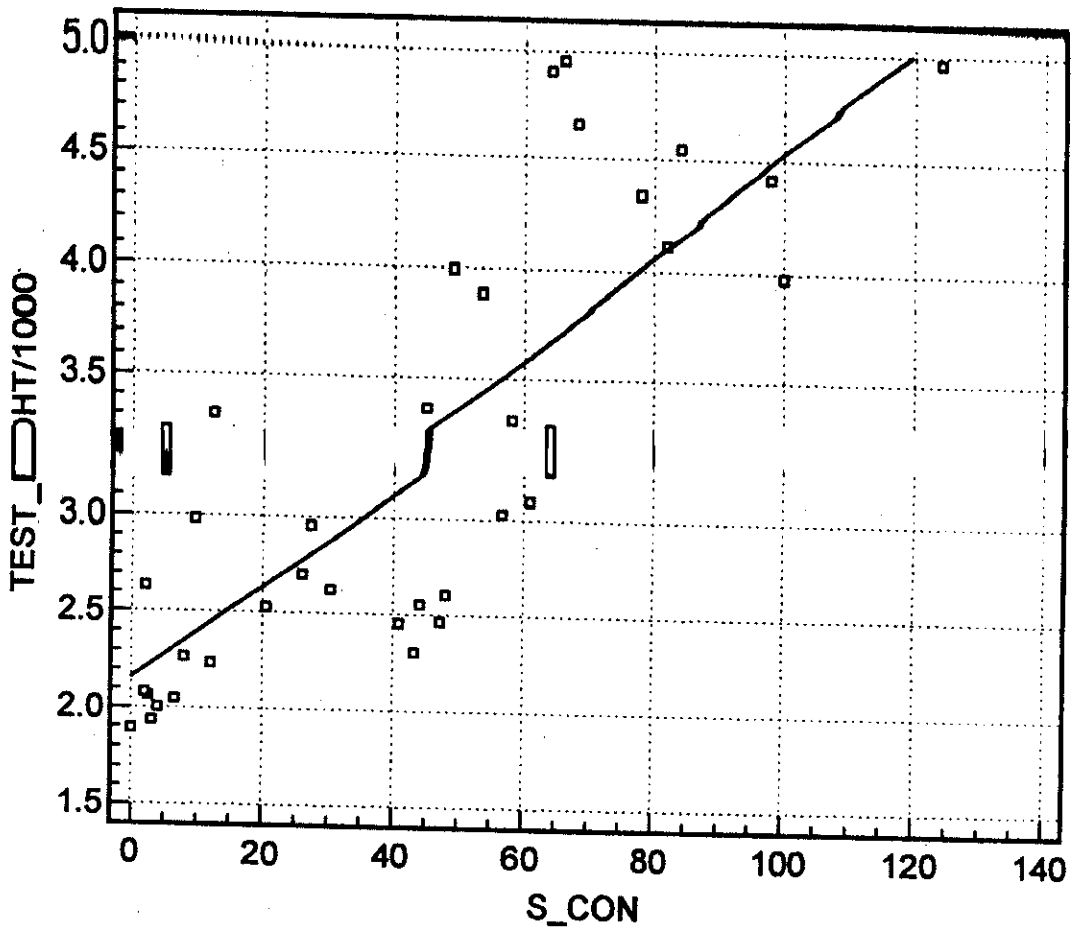

Fig. (26): The correlation between internal spermatic vein concentration of DHT and sperm concentration ($r = 0.81$, $P<0.001$).

TEST-DHT/1000 = Internal spermatic vein DHT (ng/ml)

S-CON = Sperm concentration (mill/mL).

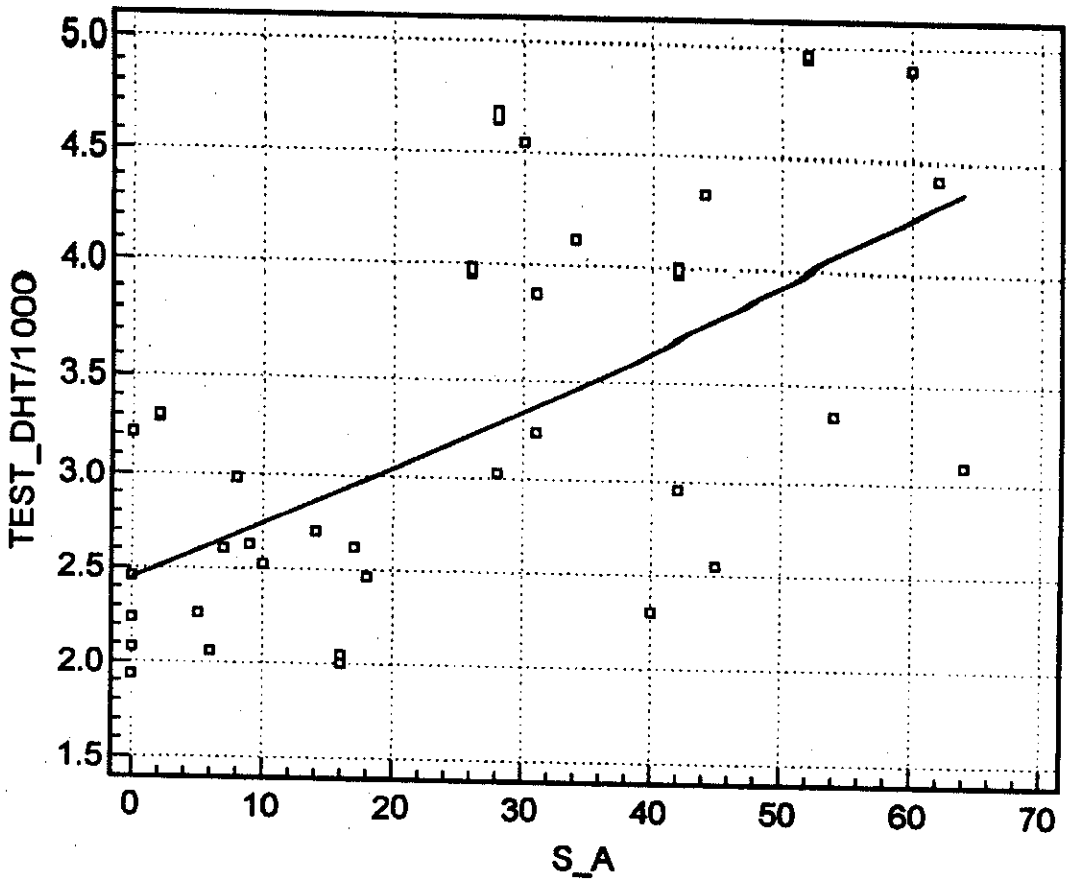

Fig. (27): The correlation between internal spermatic vein concentration of DHT and grade (a) % motility ($r = 0.64$, $P<0.001$).

TEST-DHT/1000 = Internal spermatic vein DHT (ng/ml)

S-A = Grade (a) % motility.

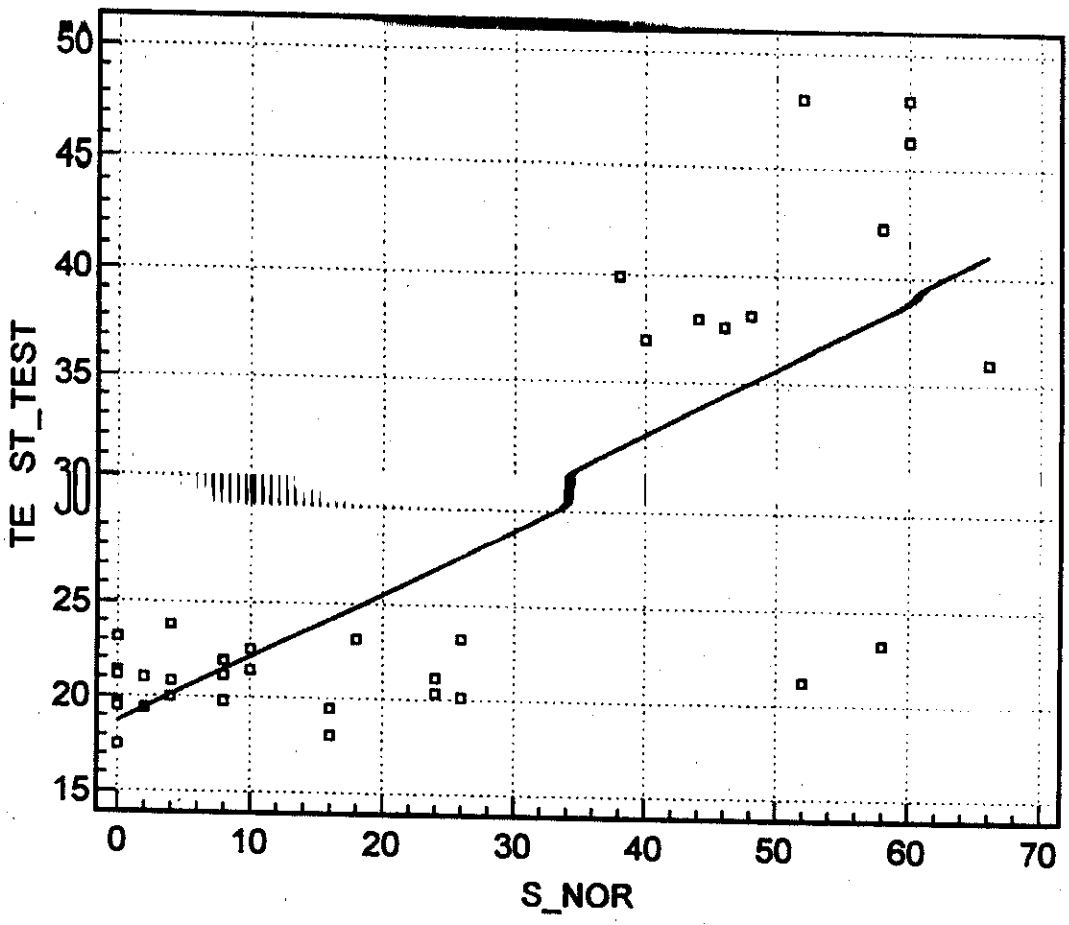

Fig. (28): The correlation between internal spermatic vein concentration of testosterone and normal morphology (r = 0.80, P<0.001).

TEST-TEST = Internal spermatic vein testosterone (ng/ml)

S-NOR = Morphology (% normal).

The correlation of the seminal plasma IL-6, serotonin, DHT and testosterone concentrations with various sperm characteristics are shown in table (16). IL-6 concentration in the seminal plasma was dierctly correlated with WBCs concentration (figure 29), while it was inversely correlated with linearity index. Serotonin, DHT and testosterone concentrations in the seminal plasma were directly correlated with sperm concentration (figures 30,31,32) grade (a) % motility, grade (a+b) % motility, percentage of normal morphology, velocity, linear velocity and α-glucosidase. On the other hand they were inversely correlated with total CDU score.

Table (16): Correlations of seminal plasma IL-6, serotonin, DHT and testosterone concentrations with various sperm characteristics and total CDU score (N = 37)

Sperm characteristics	Seminal plasma IL-6		Seminal plasma serotonin		Seminal plasma DHT		Seminal plasma testosterone	
	r	P	r	P	r	P	r	P
Sperm concentration (mill/mL)	-0.19	>0.05	0.72	<0.001	0.65	<0.001	0.41	<0.05
Grade (a) motaility (%)	-0.24	>0.05	0.59	<0.001	0.58	<0.001	0.39	<0.05
Grade (a+b) motaility (%)	-0.31	>0.05	0.52	<0.001	0.60	<0.001	0.38	<0.05
Morphology (% normal)	-0.26	>0.05	0.68	<0.001	0.72	<0.001	0.35	<0.05
Velocity (μm/sec)	-0.16	>0.05	0.53	<0.001	0.52	<0.001	0.39	<0.05
Linear velocity (μm/sec)	-0.21	>0.05	0.56	<0.001	0.51	<0.001	0.43	<0.01
Linearity index (%)	-0.33	<0.05	0.31	>0.05	0.23	>0.05	0.31	>0.05
WBCs (mill/ml)	0.91	<0.001	-0.29	>0.05	0.34	<0.05	-0.15	>0.05
Fructose (mg/dl)	-0.05	>0.05	0.15	>0.05	0.14	>0.05	0.09	>0.05
α-glucosidase (mU/ml)	-0.17	>0.05	0.64	<0.001	0.69	<0.001	0.39	<0.05
Total colour Doppler score	0.25	>0.05	-0.55	<0.01	-0.61	<0.001	-0.44	<0.05

r = correlation coefficient
P = statistical significance

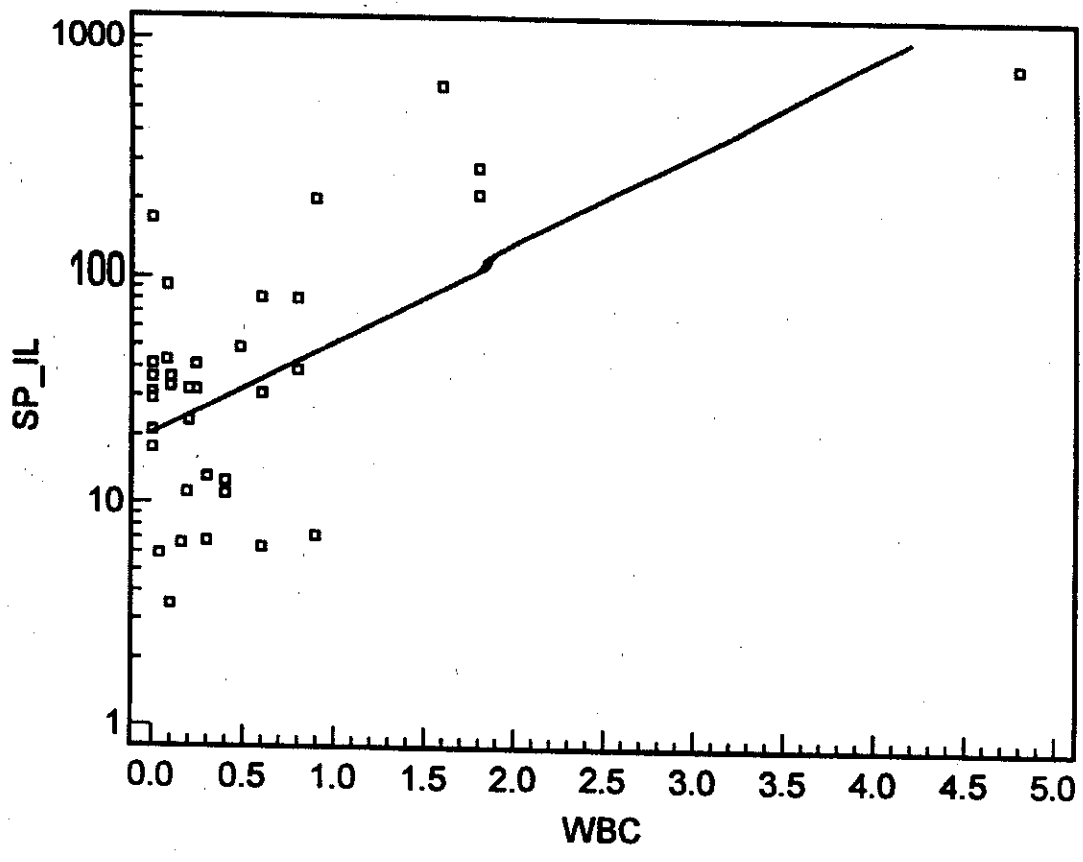

Fig. (29): The correlation between seminal plasma concentration of IL-6 and WBCs concentration ($r = 0.91$, $P<0.001$).
SP-IL = Seminal plasma IL-6 (pg/ml)

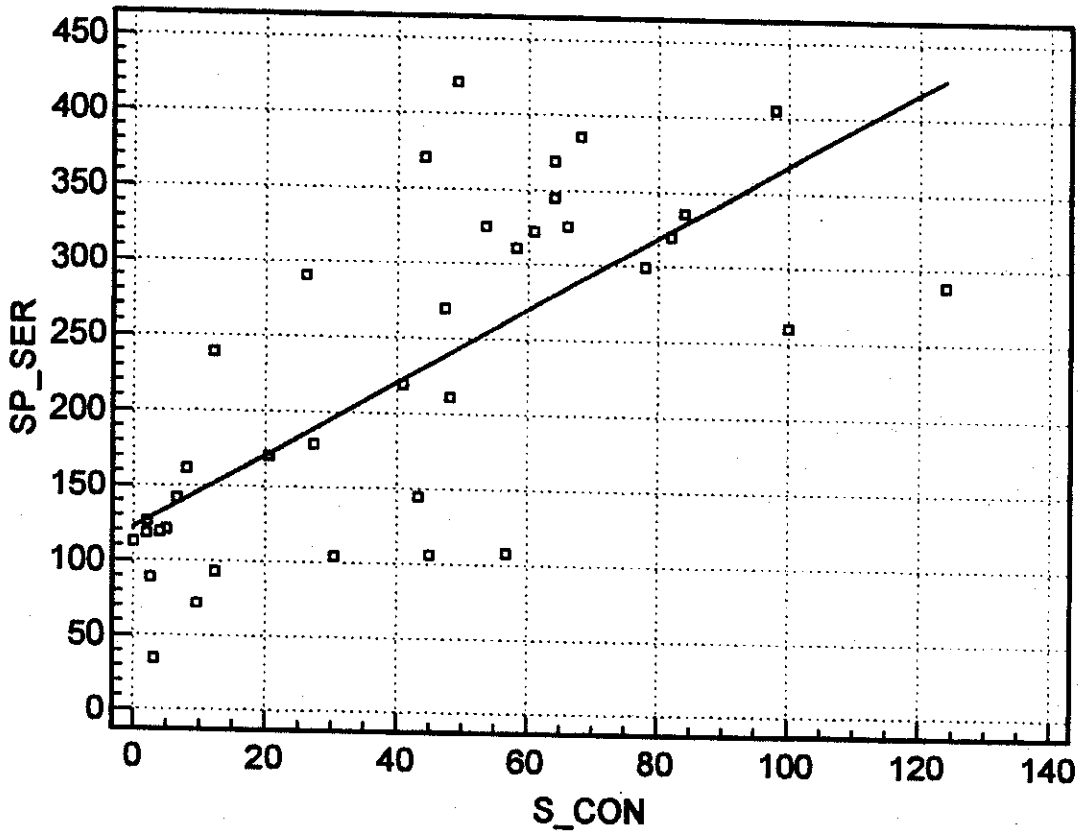

Fig. (30): The correlation between seminal plasma concentration of serotnin and sperm concentration ($r = 0.72$, $P<0.001$).
SP-SER = Seminal plasma serotonin (ng/ml)
S-CON = Sperm concentration (mill/mL).

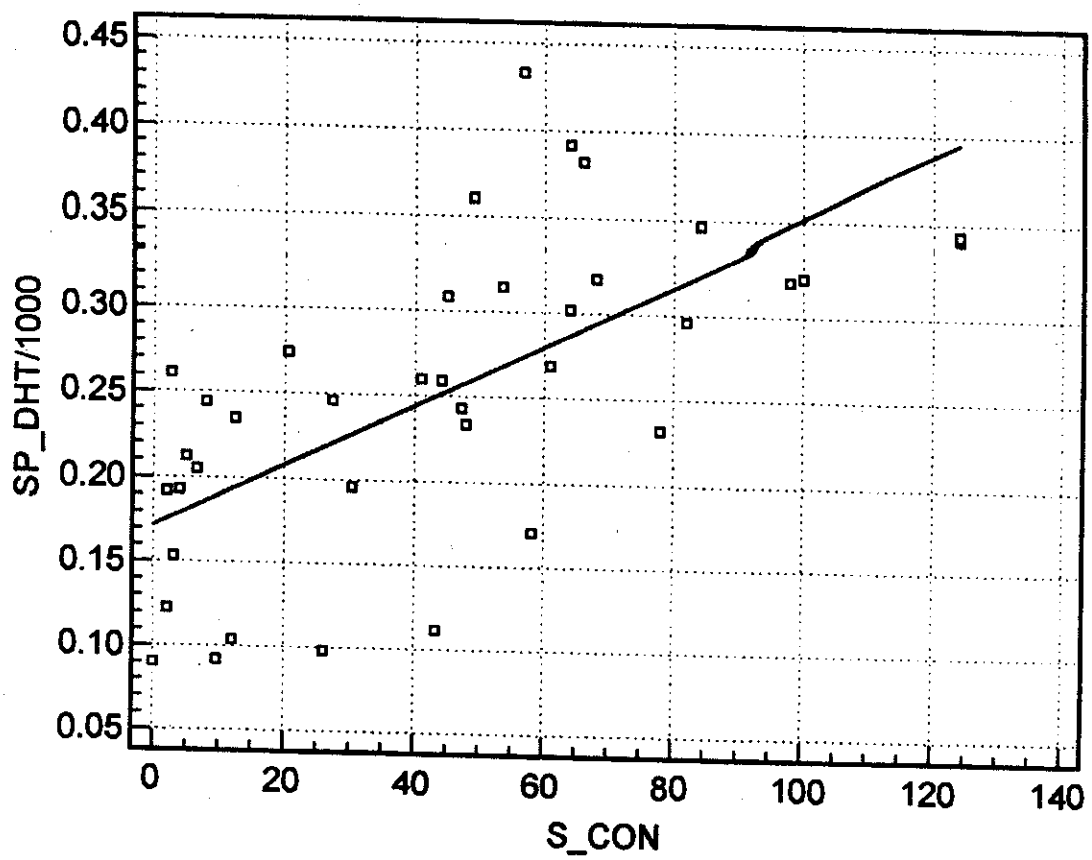

Fig. (31): The correlation between seminal plasma concentration of DHT and sperm concentration ($r = 0.65$, $P<0.001$).

TEST-DHT/1000 = Seminal plasma DHT (ng/ml)

S-CON = Sperm concentration (mill/mL).

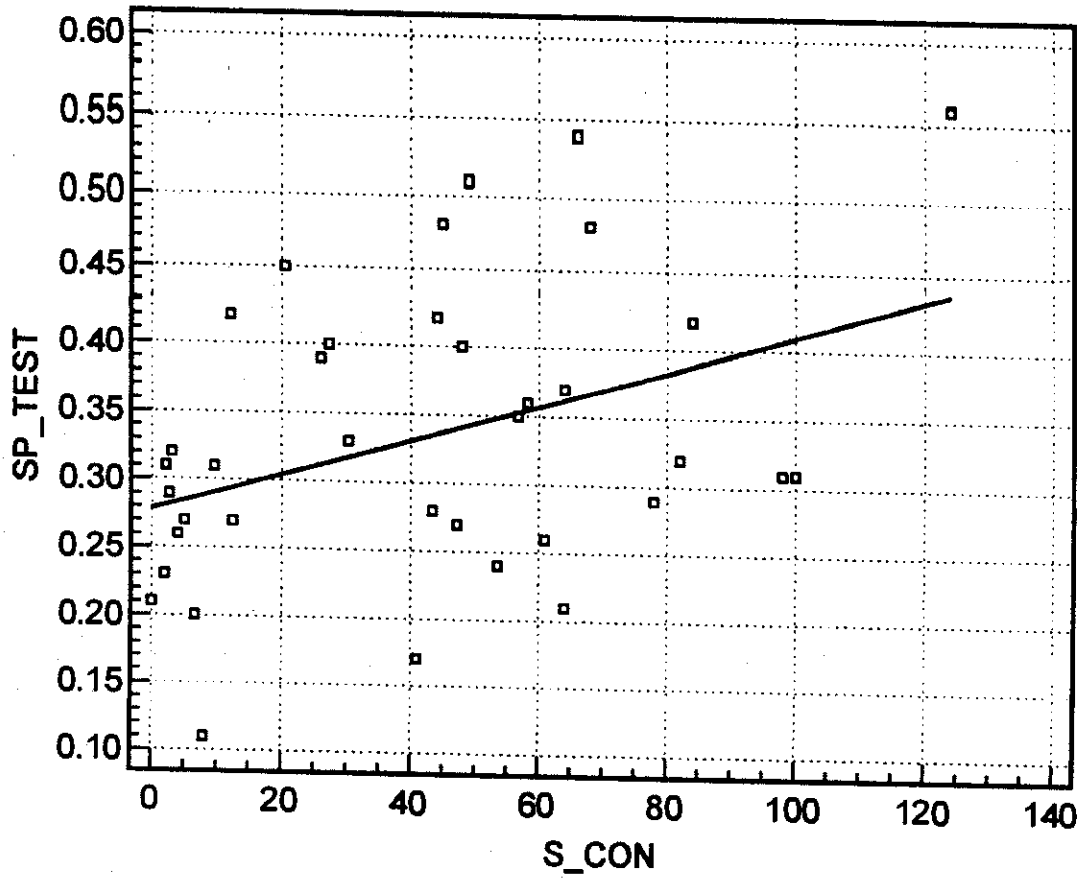

Fig. (32): The correlation between seminal plasma concentration of testosterone and sperm concentration ($r = 0.41$, $P<0.05$).
SP-TEST = Seminal plasma testosterone (ng/ml)
S-CON = Sperm concentration (mill/mL)

Table (17) shows ROC curve analyses of motility parameters of spermatozoa, to discriminate between fertile and infetile groups. Also, ROC curve analyses of seminal plasma, internal spermatic vein and peripheral venous blood concentrations of serotonin, DHT and testosterone were performed to discriminate between fertile and infertile groups.

Figures (33,34) show ROC curve analyses of internal spermatic vein testosterone and DHT to discirminate between fertile and infertile groups. Also, figures (35,36) show ROC curve of seminal plasma DHT and motile sperm concentrtaion to discrminate between fertile and infertile groups.

Table (17) ROC curve analyses to discriminate between fertile and infertile groups

	Criterion value	Sensitivity	Specificity
Grade (a) % motility	> 18%	100%	69.2%
Grade (a+b) % motility (mill/ml)	> 48%	100%	76.9%
Motile sperm concentration	> 42	90%	96.2%
Seminal serotonin(ng/ml)	> 239	100%	74%
Seminal DHT (ng/ml)	> 0.32	80%	96.3%
Seminal testosterone (ng/ml)	> 0.28	100%	48.1%
Internal spermatic vein serotonin (ng/ml)	< 153	100%	88.9%
Internal spermatic vein DHT (ng/ml)	> 3.72	100%	91.7%
Internal spermatic vein testosterone (ng/ml)	> 24.6	100%	97.2%
Peripheral venous blood serotonin (ng/ml)	< 119	100%	81.7%
Peripheral venous blood DHT (ng/ml)	> 0.365	100%	75%
Peripheral venous blood testosterone (ng/ml)	> 5.9	100%	52.8%

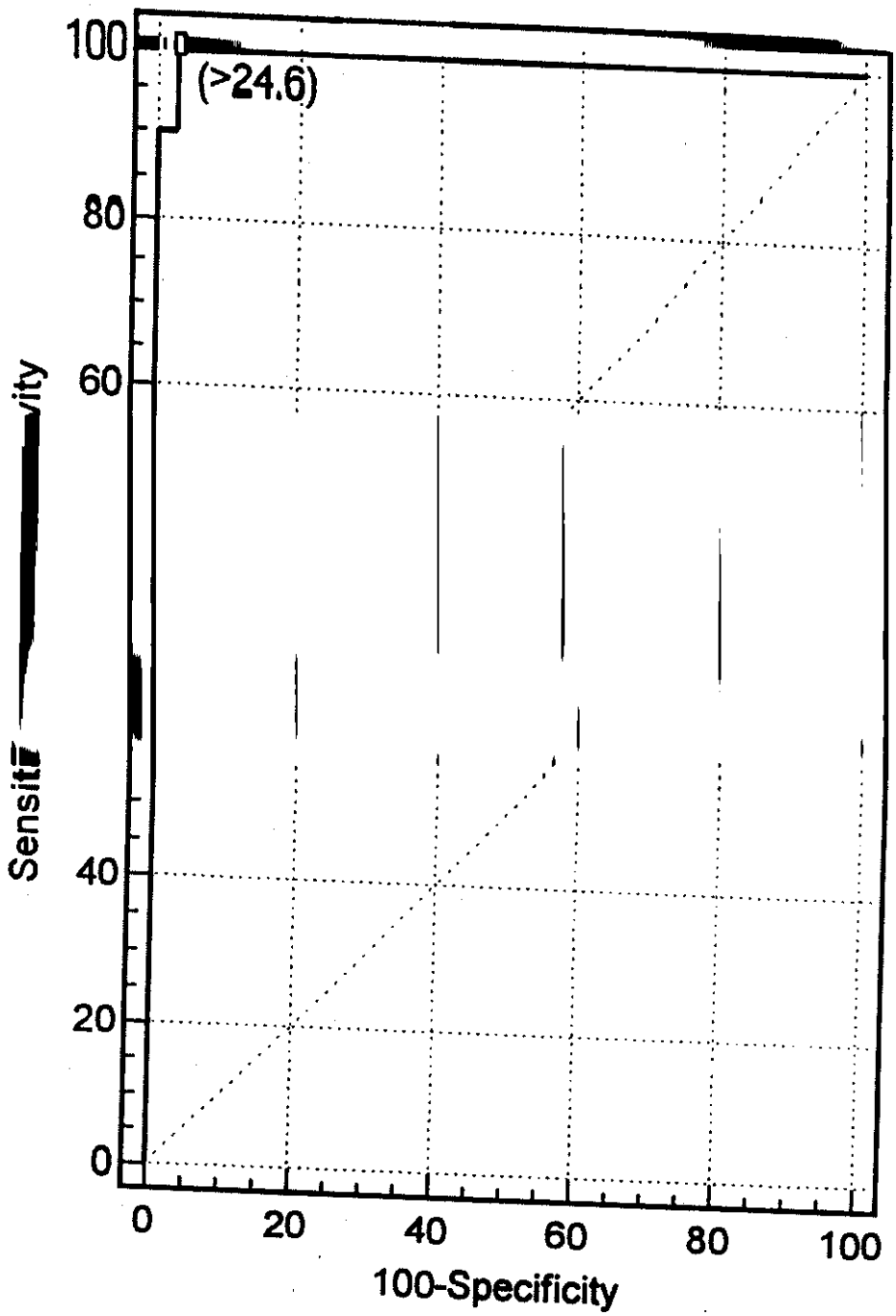

Fig. (33): ROC curve analysis of internal spermatic vein testosterone to discriminate between fertile and infertile group with criterion value >24.6 ng/mL, specificity 97.2% and sensitivity 100%.

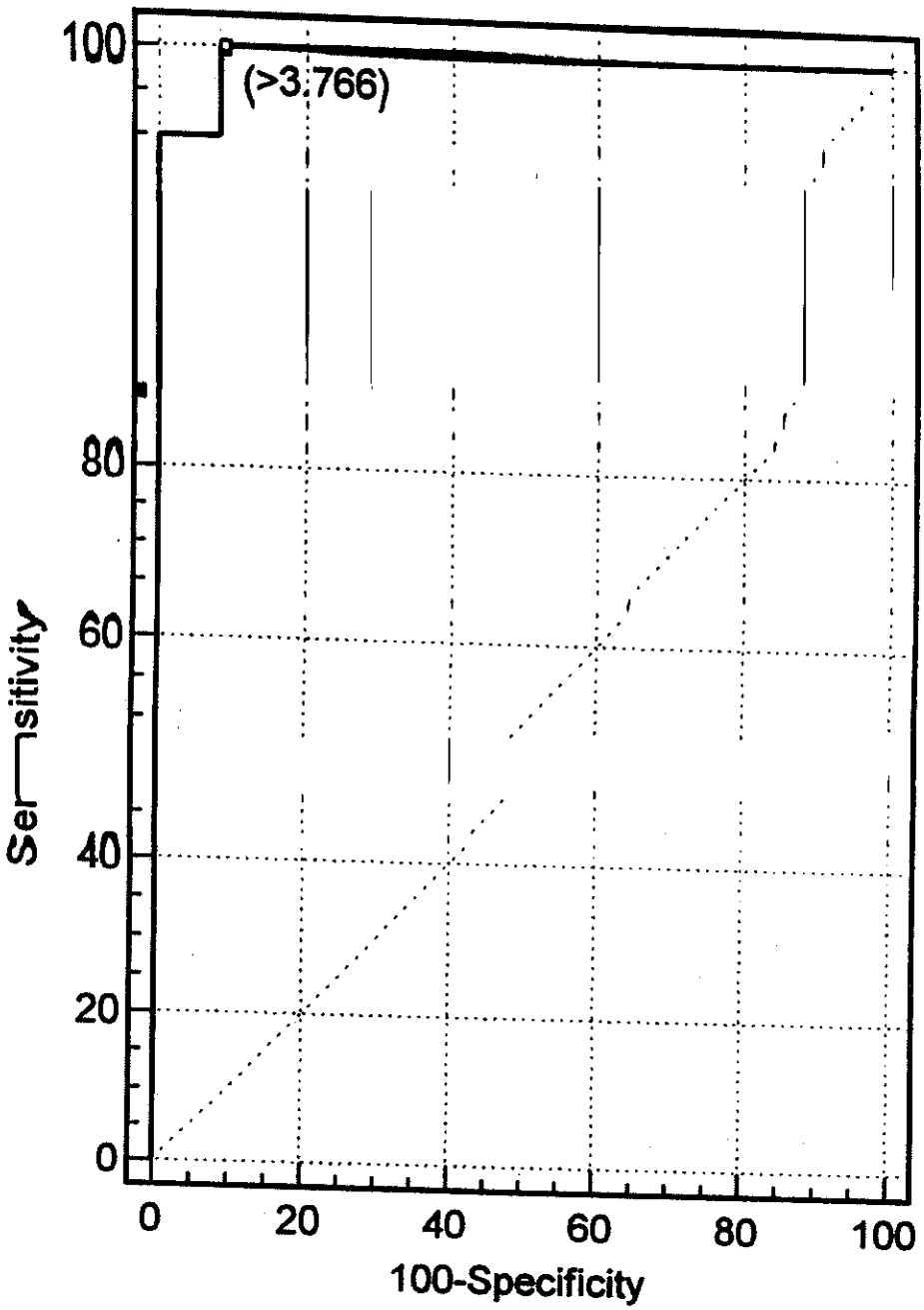

Fig. (34): ROC curve analysis of internal spermatic vein DHT to discriminate between fertile and infertile group with criterion value >3.77 ng/mL, specificity 91.7% and sensitivity 100%.

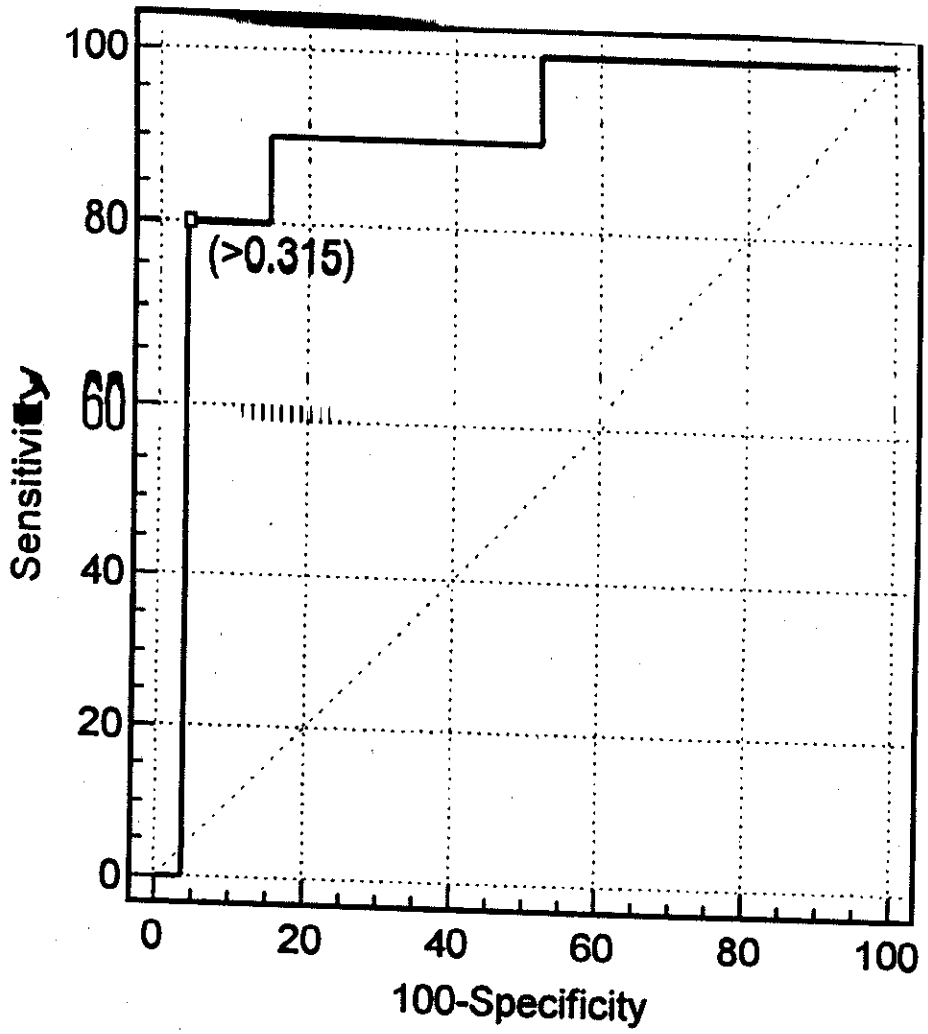

Fig. (35): ROC curve analysis of seminal plasma DHT to discriminate between fertile and infertile group with criterion value >0.32 ng/mL, specificity 96.3% and sensitivity 80%.